
DEPARTMENT OF THE ENVIRONMENT



AIR QUALITY SECTION

**NEW BRUNSWICK PRECIPITATION
MONITORING NETWORK**

ANNUAL DATA REPORT - 1990

TECHNICAL REPORT D92-14

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The number of precipitation monitoring sites was reduced during 1990 and we would like to both thank and wish good luck to those operators (Wendy Cartwright, Lawrence Cavanaugh, Wilda Fisher, Jeff Shipp, Harold Thompson, Robert Thompson, and Grant Tyreman) who left the network.

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EXECUTIVE SUMMARY

The province of New Brunswick operated 11 precipitation monitoring stations to the end of 1990. Seven precipitation monitoring sites were discontinued due to general upgrading and a reduction in the size of the program. The reduction in network size ended the intensive monitoring period 1988-1990 which supported an acid deposition modelling program (Davis, *et. al.*, 1992). With equipment upgrading all stations became standardized, and operated with MIC precipitation samplers.

Each station recorded annual wet sulphate deposition levels which were more than double the recommended critical loadings for aquatic protection ($< 8 \text{ kg/ha/yr}$, RMCC, 1990). The Lakewood Heights station in the City of Saint John reported the greatest annual wet deposition of sulphate and annual volume weighted mean sulphate concentration. The Pennfield station had the highest annual wet deposition of nitrate.

Data summaries for all stations are included with annual volume weighted means and weekly data listings.

RÉSUMÉ

À la fin de 1990, la province du Nouveau-Brunswick exploitait 11 stations de surveillance des précipitations. Sept postes de surveillance des précipitations ont été abolis vu l'amélioration générale et la réduction du programme. La réduction du réseau marquait la fin d'une période de surveillance intensive de 1988 à 1990 qui appuyait un programme de modélisation des précipitations acides (Davis, *et.al.*, 1992). L'amélioration de l'équipement a permis de normaliser toutes les stations qui utilisent des collecteurs de précipitation MIC.

Chaque station a enregistré des niveaux annuels de dépôts humides de sulfate qui dépassaient deux fois les charges critiques recommandées pour la protection aquatique ($< 8 \text{ kg/ha/année}$, CCRS, 1990). La station de Lakewood Heights dans la ville de Saint-Jean a signalé le dépôt humide annuel de sulfate le plus élevé et la plus grande concentration moyenne annuelle de sulfate pondérée en fonction du volume. La station de Pennfield a enregistré le dépôt humide annuel de nitrate le plus élevé.

Les données pour toutes les stations comprennent les moyennes annuelles pondérées en fonction du volume et les listes de données hebdomadaires.

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Map 1. Location of Sites in the New Brunswick Precipitation Monitoring Network 1990.



Legend:

- | | | |
|---------------------|------------------------|---------------------|
| 3 Nictau | 12 Lonewater Farm | 18 Shannon |
| 4 Harcourt | 13 Musquash | 19 Wirral Station |
| 6 Magaguadavic Lake | 14 Darlings Island | 20 Tracy |
| 7 Holtville | 15 Juvenile Settlement | 21 Bonny River |
| 8 Second Falls | 16 Pennfield | 23 Golden Grove |
| 9 Trout Brook | 17 South Oromocto Lake | 27 Lakewood Heights |

INTRODUCTION

The New Brunswick precipitation monitoring network began operating with four stations during the fall of 1980 (Tims, 1983). A series of CAPMoN (Canadian Air and Precipitation Monitoring Network) and MIC (MIC Inc.) type automatic wet-deposition samplers were used in the beginning. At the end of 1990, all (11) collection stations utilized the MIC type sampler.

Each MIC unit consists of a wet-only collecting bucket covered by a foam gasket under a motor driven hood. Precipitation is detected by an impedance grid which activates the motor and exposes the bucket. Food grade polyethylene bags, which are changed daily, collect the precipitation. Precipitation measurements are determined during the winters by a Nipher gauge and precipitation during frost-free times is measured with a CAPMoN type B rain gauge. The gauges and wet deposition sampler are checked at 08:00 (± 1 h) by trained operators. At this time the sample is removed and the precipitation volume determined.

The precipitation samples are immediately sealed, labelled, weighed and refrigerated in the individual plastic collection bags. The daily refrigerated samples are collected and transported to the laboratory at the end of each week (Tuesday). Samples are processed upon receipt at the New Brunswick Department of Environment Laboratory in Fredericton, N.B.. Samples from each week period are combined, mixed and one litre (or less if there was insufficient volume) decanted for analysis.

Sulphate was determined by the ion-exchange column technique on a Dionex Ion Chromatograph Model 2110 with a Varian 4270 Integrator (computer program determinations of sea-salt contribution may be found in Technical Report #T-9001 (Hughes, 1991)). Nitrate was reduced with cadmium to nitrite and then analyzed on a Technicon Auto Analyzer II. The pH was determined by a Radiometer PHM84.

Determinations of alkalinity and acidity were produced by the automated titration method. Base cation concentrations were determined by atomic absorption on a Varian Spectra AA30[®], while the Technicon Auto Analyzer II[®] was used to determine ammonium concentrations.

Sites for all the wet deposition samplers were selected on the basis that they should not be influenced by local urban and industrial emissions. To achieve this, minimum separations of 100 m were required between the samplers and any small point source of pollutants (chimney, home, parking lot, etc.) increasing to a minimum of 50 km between major sources and the wet deposition samplers. The samplers were placed upon undisturbed ground and in areas relatively accessible and secure. Further site criteria are included in more detail in Hughes (1991). Transgressions on proximity to large point sources were undertaken in some instances in order to provide data from six locations in the vicinity of Saint John, N.B. and the thermal generating station situated at Coleson Cove, N.B..

Determination of valid data followed these criteria: i) sample collection, handling and measurement followed standard protocols; ii) the sampling interval covered 7 days and; iii) no missing precipitation measurements. Invalid samples (those contaminated or failing one or more of the above criteria) were not included in the analysis (refer: Data Outlier Report pp. 61-66).

Data from these sites were compiled on both a weekly and seasonal basis (winter: December 21 - March 20; spring: March 21 - June 20; summer: June 21 - September 22; autumn: September 23 - December 20). Daily samples were bulked into weekly lots for analysis. If beginning or ending season dates occurred more than half through a weekly period the entire week was assigned to that respective season.

Analytical results were not included if data completeness ratings for valid samples were below 86%. Stations met this criteria during the period winter 1989 through winter 1990 thus providing four seasons of data for most stations.

The network was downsized during 1990. Six stations which had provided data since May 1988 were terminated May 22, 1990. The discontinued stations had operated within a 50 km radius of the city of Saint John, N.B. and were maintained (1988-1990) to provide computer model validation data. This model was adapted by Concord Environmental Corp. of Toronto (in association with the New Brunswick Power Commission) (Davis, *et.al.*, 1991).

The station situated at Golden Grove was discontinued during the autumn of 1990 due to the poor health of the station operator.

Station data summaries provide site information such as site location (latitude and longitude), elevation above sea level, land use type in the immediate vicinity (one kilometre), and the distance to the nearest saltwater coast. Annual volume weighted mean values are listed for pH, conductivity, acidity, alkalinity, hardness, sulphate and nitrate, chloride, sodium, magnesium, calcium, potassium and ammonium. Comments on the data presented within the data tables are explained in the Comment Code Descriptions section of this report (pp. 65-68).

Annual mean volume weighted values were utilized for all stated parameters. Annual precipitation measurements are the total for each station. In this report total precipitation is provided as are total wet deposition of sulphate, both background and sea-salt corrected measurements, and nitrate deposition. A listing of weekly concentrations and measurements follow each station summary.

The 30 year mean precipitation measurements presented in Figures 1 and 12 were derived from an individual stations historic data (such as Nictau) or from the nearest alternate climatological monitoring station (*i.e.* Holtville station was matched to Doaktown records; Lakewood Heights station was matched to Saint John climatological station) (Hughes and Albin, 1991, p. 25).

Results for pH, conductivity, alkalinity (Grans method), calcium, magnesium, sodium, potassium, ammonium, nitrate, chloride, sulphate, precipitation, collection efficiency and comments (including those not listed herein *i.e.* acidity (Grans), field and laboratory comments), may be obtained on disk or hardcopy from the Operations Branch, New Brunswick Department of the Environment upon request.

PRECIPITATION MONITORING STATION DATA SUMMARY - FULL YEAR OPERATION

SECOND FALLS 1990

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
47° 27' 40"	68° 13' 40"	183 m	90% Spruce Plantation 5% Buildings 5% River	170 km Northeast 100 km Northwest

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ +)
1080.2	1.779	1.745	0.234 - as N	0.185
Deposition:	22.236	21.809	12.514	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.533	19.414 $\mu\text{S}/\text{cm}^{-2}$	2.203	-1.400	0.385

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.285	0.632	0.019	0.126	0.046

Data Completeness/Representativeness.

Criteria	Winter	Spring	Summer	Fall
% Valid Samples	92	92	100	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	100	100	100	100
% Collection Efficiency	89	97	97	107
% Sea Salt	5	2	1	2

Notes: The provincial precipitation monitoring station at Second Falls received the lowest amount of precipitation recorded at all monitored locations during 1990 (Figure 1). The mean annual concentration of ammonium was the highest recorded in the province (Figure 4).

SECOND FALLS 1990

Weekly Concentrations and Measurements¹

Week	pH	Cond. µm/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.05	28.2	-5.6	.149	.012	.045	.012	.264	.570	.550	1.83	20.4	87.4	10
2	4.30	26.8	-4.0	.053	.007	.082	..	.106	.830	.218	.60	18.2	..	16
3	4.28	22.5	-4.3	.094	.012	.087	..	.110	.610	.304	2.62	17.7	88.1	13
4	4.58	16.1	-2.2	.223	.015	.093	.030	.041	.300	.870	1.14	23.3	98.0	13
5	4.96	7.5	-.8	.157	.010	.048	.015	.023	.140	.267	.61	20.4	87.8	15.13
6	4.49	23.5	-2.0	.315	.012	.175	.018	.264	.450	1.210	1.59	17.0	100.9	13
7	4.55	14.9	-2.0	.150	.011	.133	.020	.056	.300	.272	.73	20.4	105.0	10
8	4.38	31.5	-2.8	.437	.011	.074	.016	.140	.850	.028	1.99	5.9	97.5	10
9	4.36	30.8	-3.2	.888	.036	.168	.028	.257	1.090	.184	1.27	4.4	81.8	10
10								.490	.187	7.10		1.0	83.6	10
11	4.32	24.0	-3.5	.349	.013	.162	.021	.126	.280	.157	1.99	30.9	108.9	10
12	4.47	19.9	-3.0	.194	.020	.121	.023	.120	.360	.292	1.47	7.5	136.4	19
13	4.90	8.4	-1.7	.148	.030	.095	.018	.048	.130	.869	.77	4.9	82.3	13
14	4.82	11.2	-1.7	.270	.028	.166	.019	.056	.140	.308	.68	15.0	109.4	10
15	4.41	31.4	-3.8	.680	.021	.225	.034	.175	.300	.236	2.27	21.4	94.8	13
16	4.33	40.5	-4.3	.305	.020	.097	.027	.328	.350	.183	3.62	15.1	105.1	13
17				.859	.191						1.00	.3	171.3	19
18	4.78	17.7	-.8	.281	.041	.181	.056	.279	.230	.356	2.27	18.4	108.9	13
19	4.56	19.1	-2.2	.044	.047	.437	.064	.141	.180	.497	1.68	18.1	92.9	13
20	4.67	10.8	-2.0	.032	.016	.142	.032	.065	.100	..	.93	31.8	130.7	13.19
21	5.17	4.5	-1.0	.234	.008	.060	.049	..	.020	.648	6.39	27.4	110.8	13
22	4.00	51.3	-6.5	.530	.053	.204	.219	.340	.470	.652	6.17	8.0	92.2	15.13
23				.256	.035	.202			.540	.265	3.61	1.9	..	16
24	4.28	37.0	-3.4	.153	.022	.100	.043	.382	.390	.364	3.45	38.2	102.1	15
25	4.57	21.0	-2.2	.071	.005	.034	.034	.192	.210	.037	1.81	43.8	101.6	13
26	4.16		-4.9	.186	.020	.053	.028	.409	.510	.198	3.99	3.9	93.6	13
27	4.53	13.4	-2.0	.065	.014	.044	.027	.095	.100	.097	1.29	24.4	100.3	13
28	4.60	5.8	-1.2	.041	.014	.051	.013	.011	.090	.151	.41	5.3	..	16.13
29	4.63	13.8	-1.4	.042	.014	.032	.020	.276	.120	.023	1.47	31.8	101.8	13.15
30	4.78	8.0	-1.0	.005	.012	.030	.011	.000	.100	.136	1.64	6.5	..	16.13
31	4.39	22.5	-2.6	.129	.030	.149	.036	.181	.330	.348	1.80	4.8	96.8	13
32	4.20	30.6	-3.6	.029	.010	.034	.020	.032	.210	.156	3.11	74.0	..	15.17.13
33	4.32	20.1	-3.3	.084	.020	.052	.032	.619	.180	.094	2.20	6.2	..	16
34	4.68	8.3	-2.2	.056	.009	.053	.037	.120	.070	.165	1.02	65.0	112.2	13
35	4.83	5.8	-1.7	.124	.016	.068	.010	.013	.130	.199	.29	5.0	88.9	13
36	4.75	10.7	-1.0	.075	.011	.043	.010	.112	.120	.189	1.13	18.8	100.5	13
37	4.82	8.6	-2.0	.082	.019	.070	.019	.121	.100	.295	.83	20.4	104.2	13
38	5.07	3.7	-1.0	.066	.010	.039	.014	.030	.020	.074	.32	69.7	100.7	13
39	4.03	61.0	-7.4	.071	.013	.059	.020	.450	.670	.145	5.52	40.6	90.1	15.13
40	4.32	29.2	-3.6	.127	.026	.136	.331	.450	.400	.318	2.91	35.3	101.7	15.13
41	5.77	9.5	5.0	.089	.042	.294	.195	.588	.090	.433	1.50	59.4	101.4	15.13
42	4.52	12.1	-16.0	.060	.029	.213	.029	.122	.120	.431	1.01	23.1	99.1	13.15
43	5.21	3.3	-1.5	.040	.006	.035	.012	.016	.010	.159	.49	59.0	..	17.13
44	4.40	32.4	-2.9	.182	.032	.104	.041	.709	.610	.207	3.33	13.3	135.5	19
45	5.03	4.9	-1.4	.038	.011	.054	.020	.025	.060	.206	.44	69.5	132.5	15.33.19
46	4.50	16.0	-2.1	.091	.020	.168	.112	.384	.360	.377	1.52	32.5	97.8	10
47	4.13	36.8	-4.5	.044	.017	.060	.023	.332	.690	.020	2.34	14.9	..	27
48	4.99	5.0	-1.4	.009	.009	.030	.011	.026	.090	.063	.45	26.7	102.0	10
49	5.66	8.1	0.9	.018	.011	.086	.010	.028	.160	.082	.55	30.8	..	17.27
50	4.01	65.6	-8.1	.293	.042	.249	.043	.486	1.490	.467	4.41	5.7	..	17
51	6.97	51.8	20.7	.306	.063	11.800	.061	.390	.220	1.030	1.16	56.9	99.2	15.34.13
52	4.38	13.4	-5.1	.044	.011	.037	.011	.039	.220	.044	.80	14.8	84.2	10

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as " -.- ". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

NICTAU 1990

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
47° 14' 05"	67° 09' 20"	55 m	80% Forest 5% Pasture 10% Homestead 5% River	160 km Northeast

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ ⁺)
1457.5	1.381	1.361	0.210 - as N	0.139
Deposition:	20.12	19.839	13.097	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.532	15.146 $\mu\text{S}/\text{cm}^2$	1.831	-2.684	0.282

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.155	0.075	0.014	0.090	0.023

Data Completeness/Representativeness.

Criteria	Winter	Spring	Summer	Fall
% Valid Samples	92	77	100	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	100	95	100	100
% Collection Efficiency	90	97	95	93
% Sea Salt	2	2	1	1

Notes: Nictau departed significantly from its 30 year precipitation annual mean (1950-1980 at Nictau) and experienced precipitation levels typically found only along the southern coast of the province (Figure 1). Annual mean levels of chloride, sodium, magnesium, calcium and potassium were the lowest observed in the network (Figure 9).

NICTAU 1990

Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ⁻¹	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.19	32.5	-3.6	.126	.003	.115	.021	.186	.700	.380	1.74	13.4	97.3	10
2	4.13	29.1	-5.7	.049	.008	.083	--	.151	.930	.264	.95	17.8	91.9	10
3	4.12	37.9	-6.2	.045	.005	.122	.008	.267	.740	.270	2.09	19.6	95.9	10
4	4.42	14.4	-3.5	.202	.013	.049	.021	.036	.240	.202	1.04	25.2	112.5	16
5	5.04	5.1	-1.5	.182	.012	.047	.023	.013	.080	.138	.51	16.4	68.6	10
6	4.59	13.1	-2.0	.315	.008	.133	.019	.056	.220	.344	1.01	19.8	84.7	10
7	4.55	19.7	-2.2	.348	.018	.148	.022	.094	.370	.085	1.39	19.0	75.2	16
8	4.20	29.4	-3.4	.225	.011	.113	.025	.161	.510	.353	1.77	13.0	84.6	10
9	4.32		-2.8	.682	.017	.188	.020	.015	.480	.308	2.21	4.8	61.8	10
10												--	--	4
11	4.22	24.9	-5.7	.297	.022	.190	.031	.164	.490	.356	1.94	22.2	--	16
12	4.16	36.3	-4.6	.396	.055	.259	.056	.228	.750	.403	2.47	13.6	99.8	10
13	4.96	11.6	-1.6	.733	.036	.094	.026	.035	.130	.055	1.59	5.4	79.5	16
14												8.0	--	1.20
15	4.63	15.8	-2.7	.105	.011	.104	.020	.101	.200	.195	1.06	29.8	98.7	13.15
16	4.18	33.3	-4.1	.247	.017	.169	.022	.250	.400	.022	2.41	23.0	--	16
17												--	--	4
18	4.74	11.7	-1.5	.095	.070	.212	.033	.103	.130	.140	1.16	17.6	--	16
19	4.80	17.8	-1.7	.429	.099	.195	.063	.376	.350	.272	2.37	13.6	89.5	15
20	4.81	10.7	-1.7	.058	.014	.057	.034	.052	.110	.860	1.02	8.6	100.9	10
21	5.60	3.1	-2	--	.002	.023	.007	.002	.020	.002	.18	19.0	--	16
22	4.39	24.5	-2.6	.416	.043	.192	.129	.256	.310	.294	3.03	14.2	90.5	15
23	5.23	15.1	-.4	.271	.017	.051	.072	.056	.140	--	1.79	17.2	--	16
24	4.23	32.9	-4.3	.148	.025	.086	.045	.351	.420	.214	3.04	14.6	93.2	15
25	4.50	15.7	-2.5	.120	.016	.082	.028	.206	.250	.178	1.33	53.2	98.8	13
26	4.18	48.2	-5.8	.199	.032	.033	.053	.540	.510	.173	5.24	12.0	103.8	15
27	4.80	11.2	-1.6	.103	.016	.046	.025	.062	.120	.164	1.00	30.0	89.7	15
28	5.09	5.4	.2	--	.007	.022	.016	.021	.050	.024	.49	11.0	102.2	10
29	4.67	11.4	-1.7	.007	.009	.024	.018	.006	.090	--	1.38	107.4	--	16
30	4.81	8.6	-.9	.018	.008	.030	.009	.004	.100	.128	.52	34.4	95.9	10
31	4.93	7.0	-.7	.064	.012	.030	.016	.000	.100	.077	.41	20.4	77.3	15
32	4.48	19.8	-2.7	.042	.011	.042	.028	.307	.200	.413	2.10	89.8	--	16.15
33	4.52	17.4	-2.5	.028	.008	.023	.014	.355	.120	.063	2.08	39.8	90.1	13
34	4.44	15.6	-2.8	.077	.011	.037	.023	.367	.160	.138	1.79	38.6	100.7	15
35	4.53	11.0	-2.4	.078	.011	.035	.014	.080	.140	.148	.99	10.4	91.5	15
36	4.25	24.5	-5.2	.062	.009	.047	.025	.253	.300	.067	2.53	14.0	--	15.16
37	5.01	5.8	-1.4	.044	.008	.043	.014	.059	.120	.100	.49	24.0	105.5	10
38	4.82	5.7	-2.7	.021	.004	.031	.007	.009	.070	.158	.42	24.2	91.3	13
39	4.08	48.4	-6.3	.182	.028	.074	.033	.800	.580	.166	5.03	14.6	98.6	15
40	4.17	32.4	-5.3	.169	.031	.086	.041	.475	.430	.197	3.40	38.6	91.3	15
41	4.72	9.3	-2.1	.037	.009	.096	.022	.016	.090	.207	.94	100.4	98.4	10
42	4.35	18.5	-3.3	.061	.021	.171	.031	.140	.220	.310	.81	24.5	92.2	15
43	5.11	3.4	-1.5	.025	.007	.048	.016	.000	.040	.120	.31	85.4	--	16
44	4.42	34.5	-3.8	.223	.042	.105	.052	.977	.710	.067	3.85	17.2	96.9	10
45	5.30	6.5	-.7	.031	.008	.050	.015	.031	.050	.048	.83	62.4	101.0	13
46	4.66	13.3	-1.1	.014	.007	.041	.016	.182	.230	--	1.07	51.6	88.1	13
47	4.42	24.7	-3.1	--	.005	.053	.016	.167	.310	.009	1.91	24.4	--	20.29
48	4.86	9.1	-2.0	.050	.011	.081	.010	.000	.160	.137	.59	14.8	--	27
49	5.63	3.2	-.6	--	.004	.038	.003	.000	.020	.210	.33	41.2	89.3	10
50												6.0	--	6.9.25
51	4.34	10.1	-6.5	.031	.006	.083	.020	.018	.160	.050	.67	83.4	94.0	10
52	4.60	10.4	-4.4	.047	.010	.183	.024	.024	.150	.041	.67	28.0	93.5	10

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

TROUT BROOK 1990

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
47° 07' 00"	65° 47' 40"	160 m	80% Forest 15% Pasture 5% Homestead	45 km East

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ +)
1329.5	1.269	1.230	0.192 - as N	0.103
Deposition:	16.872	16.354	10.937	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.543	14.706 $\mu\text{S}/\text{cm}^2$	1.918	-2.451	0.305

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.305	0.135	0.018	0.092	0.023

Data Completeness/Representativeness.

Criteria	Winter	Spring	Summer	Fall
% Valid Samples	85	92	100	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	87	100	100	100
% Collection Efficiency	61	99	95	94
% Sea Salt	3	3	2	2

Notes: The lowest amount of wet sulphate and nitrate deposition was found at this site (Figs. 7 & 8) as was the lowest annual mean volume weighted conductivity. This site also tied with the Harcourt station as the lowest ranked location for volume weighted wet sulphate concentration and deposition.

TROUT BROOK 1990

Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1				.213	.054				.550	.480	1.14	2.8	39.6	18
2	4.11	48.5	-5.9	.230	.017	.160	--	.150	.800	.491	2.86	27.0	62.4	13
3	4.34	28.7	-3.7	.162	.009	.054	--	.156	.600	.480	1.89	14.4	85.6	10
4	4.71	10.8	-1.7	.180	.009	.045	.011	.037	.190	.339	.75	34.3	86.6	13
5												28.4	--	1.25
6	4.94	7.8	-.7	.143	.008	.110	.013	.048	.110	.462	.40	25.2	66.3	16
7	4.35	24.9	-2.9	.250	.031	.173	.022	.134	.620	.579	1.20	21.0	59.8	10
8	3.89		-6.7	.793	.042	.325	.073	.286	1.130	.655	4.52	8.9	43.5	13.18
9	4.48		-1.7	.852	.045	.316	.028	.037	.350	.817	2.50	4.2	58.7	10
10												--	--	4
11	4.45	22.1	-3.1	.221	.018	.174	.024	.068	.410	.337	1.88	12.9	89.0	10
12	4.25	24.1	-3.7	.460	.042	.240	.025	.086	.450	.376	1.64	16.1	75.2	10
13	4.50	15.1	-2.7	.547	.019	.121	.024	.039	.100	.386	1.58	13.9	70.5	10
14	4.92	9.3	-1.5	.252	.030	.182	.020	.041	.100	.933	.73	27.8	97.6	10
15	4.60	12.7	-2.7	.110	.016	.152	.019	.116	.150	.313	.90	33.9	70.0	10
16	4.30	28.6	-3.2	.417	.022	.282	.062	.203	.290	.282	2.19	19.5	115.7	13.19
17									.890	.314	8.16	1.4	63.9	10
18	4.57	16.3	-2.1	.102	.032	.174	.040	.121	.160	.461	1.64	14.8	170.7	19
19	4.49	17.5	-2.6	.072	.055	.389	.028	.175	.130	.584	1.74	11.6	--	16
20	4.93	8.0	-1.3	.013	.020	.103	.012	.025	.070	.278	.67	43.5	101.9	10
21	5.41	4.8	-.5	--	.027	.183	.013	.000	.040	.693	.26	14.6	101.9	10
22	5.02	5.3	-.7	.044	.011	.110	.022	.031	.040	.102	.48	30.5	--	16
23				.232	.049				.910	.265	4.50	1.4	80.4	10
24	4.36	21.8	-3.6	.101	.021	.368	.084	.216	.200	.558	2.13	59.4	--	13.15.16
25	4.27	34.0	-4.2	.136	.045	.181	.056	.289	.440	.843	3.19	18.3	93.8	13
26								.343			1.09	0.6	74.5	10
27	4.64	11.9	-1.5	.011	.014	.044	.020	.111	.120	.286	1.11	37.1	--	25.9
28	5.09	4.3	-1.2	--	.009	.023	.013	.023	.040	.110	.40	9.6	99.6	10
29	4.66	12.1	-.9	--	.007	.035	.012	.042	.110	.091	.96	47.0	--	16
30	4.84	7.2	-1.0	.091	.008	.026	.012	.012	.080	--	.54	81.0	--	15.49.20.16
31	5.01	5.0	-.9	.026	.016	.044	.021	.000	.080	.222	.26	11.7	99.8	10
32	4.92	6.0	-.8	.039	.013	.095	.019	.059	.070	.251	.47	89.2	--	15.16.20
33	4.02	37.3	-6.0	.030	.009	.050	.020	.403	.300	.201	3.82	29.3	101.8	13
34	4.40	18.2	-2.8	.074	.013	.049	.009	.439	.260	.158	1.62	10.8	95.3	10
35	4.61	7.1	-2.6	.043	.009	.027	.007	.918	.110	.175	.54	7.1	102.5	10
36	4.04	51.3	-7.5	.070	.015	.046	.025	.384	.610	.204	4.65	11.1	95.2	15
37	4.43	27.1	-3.5	.087	.044	.332	.023	.318	.320	.491	2.41	7.5	89.9	10
38	4.79	8.1	-1.9	.014	.006	.065	.007	.033	.070	.197	.71	24.8	--	33.30
39	4.03	56.3	-7.4	.124	.038	.223	.034	.612	.540	.508	5.49	13.2	90.0	10
40	4.24	27.9	-4.2	.117	.029	.130	.030	.275	.280	.241	2.90	24.0	94.5	10
41	4.28	28.4	-3.4	.060	.036	.313	.029	.106	.250	.499	2.28	33.2	99.5	15
42	5.09	7.6	-1.2	.034	.046	.365	.028	.014	.020	.696	.64	14.5	100.3	13
43	5.17	3.3	-.9	.027	.009	.058	.018	.000	.010	.176	.35	65.6	--	16
44	4.26	42.4	-4.4	.345	.068	.218	.051	.790	.890	.370	4.21	5.1	119.7	19
45	5.17	5.4	-1.0	.040	.019	.119	.017	.044	.030	.258	.57	77.0	90.9	10
46	4.50	17.5	-2.7	--	.009	.080	.015	.172	.310	.075	1.15	54.6	80.5	10
47	4.46	13.9	-2.8	--	.009	.080	.013	.105	.170	.171	1.09	25.8	94.1	10
48	4.67	11.2	-3.4	.041	.020	.161	.014	.000	.220	.799	.61	6.4	93.9	10
49	5.28	4.7	-2.1	.006	.008	.061	.010	.000	.060	.118	.39	61.8	75.1	10
50	4.32	26.3	-4.6	.109	.072	.692	.060	.054	.440	.926	1.53	23.0	--	16
51	4.44	10.1	-5.1	.047	.013	.109	.026	.018	.150	.143	.62	62.9	63.2	34.13
52	4.33	19.1	-4.7	.044	.006	.032	.011	.031	.260	.035	1.20	9.8	64.2	10

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

HOLTVILLE 1990

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
46° 31' 15"	66° 28' 40"	183 m	80% Pasture 15% Forest 5% Homestead	180 km East

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ ⁺)
1396.8	1.537	1.491	0.221 - as N	0.113
Deposition:	21.743	21.085	13.427	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.500	17.672 μ S/cm ²	1.775	-2.478	0.439

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.348	0.195	0.022	0.141	0.032

Data Completeness/Representativeness.

Criteria	Winter	Spring	Summer	Fall
% Valid Samples	100	92	86	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	100	100	99	100
% Collection Efficiency	70	85	100	84
% Sea Salt	3	2	2	3

Notes: This site experienced the lowest mean pH of any recorded outside of the southern coastal zone (Figure 2).

HOLTVILLE 1990

Weekly Concentrations and Measurements¹

Week	pH	Cond. μs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.19	30.9	-3.7	.115	.012	.179	.024	.125	.720	.424	1.45	4.7	102.8	10
2	4.23	28.3	-4.9	.077	.028	.278	--	.122	.690	.599	1.22	28.9	71.7	10
3	3.94	57.9	-8.6	.219	.015	.329	.018	.384	1.180	.348	3.13	17.1	106.1	10
4	4.46	17.1	-2.5	.173	.012	.054	.020	.076	.260	.366	1.17	42.9	--	15.9.25
5				.719	.011	.086	.015		.100	.193	1.74	20.6	12.5	13.18
6	4.48	28.1	-2.3	.386	.014	.143	.022	.135	.400	.416	2.38	3.8	211.4	19
7	4.36	23.3	-2.9	.326	.042	.312	.016	.178	.400	.332	1.70	14.7	82.6	20
8	4.03	43.8	-4.9	.273	.012	.095	.020	.120	.850	.259	2.26	19.6	44.0	18
9	4.40	24.3	-2.0	.478	.041	.321	.035	.027	.370	.677	1.71	5.7	69.1	10
10														
11	4.14	30.6	-6.0	.279	.018	.114	.018	.111	.650	.266	2.37	15.7	--	4
12	4.24	32.8	-3.7	.497	.062	.345	.034	.206	.570	.616	2.57	23.9	55.8	18
13	4.63		-1.7	1.0	.031	.176	.027	.078	.060	.354	3.43	12.1	61.5	13
14	4.62	16.4	-2.5	.258	.029	.306	.027	.120	.170	1.27	1.02	30.2	93.7	10
15	4.65	16.7	-2.2	.362	.027	.160	.029	.170	.190	.194	1.31	52.5	66.9	10
16	4.22	32.0	-3.7	.308	.026	.316	.041	.222	.320	.139	2.46	22.9	--	16
17				1.42	.103	.411	.144		.560	.350	7.20	3.1	51.5	15.18
18	4.71	12.0	-1.6	.051	.026	.174	.030	.119	.090	.243	1.30	19.5	104.5	10
19	4.65	13.3	-1.8	.051	.040	.328	.027	.095	.110	.443	1.27	31.8	99.0	10
20	4.62	13.3	-2.0	.232	.011	.086	.021	.039	.140	.203	1.40	37.3	97.1	10
21	5.84	4.5	.5	.238	.012	.067	.017	.002	.020	.217	.67	18.7	--	29.19
22	5.24	6.1	-.7	.227	.014	.058	.026	.021	.060	.115	.89	34.8	101.8	13
23	3.95		-6.2	.847	.034	.042	.042	.057	.730			2.1	--	17
24	4.05	48.3	-7.1	.079	.013	.109	.028	.367	.420	.736	4.63	9.4	--	16.15
25	4.46	23.6	-3.1	.096	.010	.056	.028	.209	.310	.332	1.87	22.3	99.0	11.15
26	4.33	32.1	-4.0	.093	.009	.051	.044	.132	.250	.356	2.72	21.6	106.6	10
27	4.26	33.1	-4.7	.142	.027	.077	.029	.242	.340	.178	3.18	12.0	--	15.9.25
28								.130				2.6	63.3	13
29	4.29	22.7	-2.7	--	.008	.040	.015	.053	.260	.094	1.58	28.5	99.7	10
30	4.73	9.3	-1.1	.017	.005	.037	.013	.033	.110	.251	.76	96.8	--	16.15.9.25
31	4.86	6.4	-1.0	.041	.014	.060	.012	.029	.100	.284	.33	12.5	105.7	11.15
32	4.27	21.0	-3.5	.098	.026	.243	.086	.182	.170	.335	2.12	48.2	102.1	15
33	4.04	53.4	-5.5	.395	.049	1.080	.377	.631	.290	1.840	6.32	26.2	100.2	15
34	4.76	8.9	-1.3	.046	.008	.030	.014	.117	.150	.198	.81	22.6	88.9	15
35	4.46	18.7	-2.4	.068	.010	.048	.011	.099	.150	.211	1.82	8.7	103.1	10
36	4.05	37.8	-4.8	.086	.021	.138	.012	.379	.390	.373	3.28	16.4	95.1	10
37	4.64	11.9	-2.7	.050	.023	.172	.015	.108	.150	.390	1.12	44.6	105.9	15
38	4.89	8.2	-1.2	.062	.014	.225	.024	.044	.120	.259	.77	27.3	101.3	34
39	3.96	56.0	-7.2	.049	.018	.150	.027	.450	.490	.269	5.26	16.8	100.4	10
40	4.34	25.1	-3.2	.043	.019	.146	.019	.233	.260	.279	2.28	28.9	97.9	10
41	4.53	16.4	-2.7	.064	.067	.562	.044	.071	.180	.897	1.24	43.9	99.0	10
42	4.87	10.0	-1.7	.059	.059	.502	.035	.046	.060	.890	.84	57.3	96.0	10
43	5.37	2.4	-.9	.028	.004	.031	.012	.009	.010	.131	.31	50.2	94.8	13
44	4.21	48.8	-4.8	.256	.039	.137	.053	.767	.790	.201	5.41	7.4	81.9	13
45	5.51	5.5	-.3	.031	.013	.075	.014	.048	.050	.146	.68	71.6	62.1	10
46	4.80	11.2	-1.2	.181	.017	.112	.030	.105	.180	.023	1.09	60.2	68.3	13
47	4.35	25.9	-3.1	--	.019	.178	.021	.193	.350	.227	1.86	22.3	92.6	10
48	4.85	8.6	-2.7	.010	.013	.120	.008	.000	.120	.252	.62	22.2	52.4	10
49	5.32	5.3	-.8	--	.007	.067	.003	.000	.020	.112	.44	57.7	--	16.13
50		35.7		.110	.072	.633	.043	.111	.620	.865	2.07	22.4	60.5	13.34.9
51	4.54	11.4	-3.5	.064	.016	.320	.042	.024	.170	.050	.75	70.8	91.4	13
52	4.68	14.0	-2.1	.034	.007	.031	.013	.026	.240	.051	.66	20.6	87.5	13

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

HARCOURT 1990

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
46° 29' 03"	65° 15' 40"	45 m	80% Forest 20% Homestead	93 km East

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ +)
1436.6	1.232	1.179	0.184 - as N	0.078
Deposition:	17.702	16.932	11.331	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.549	15.503 $\mu\text{S}/\text{cm}^{-2}$	1.804	-2.531	0.383

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.398	0.231	0.026	0.110	0.024

Data Completeness/Representativeness.

Criteria	Winter	Spring	Summer	Fall
% Valid Samples	100	92	93	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	100	100	100	100
% Collection Efficiency	66	88	77	94
% Sea Salt	5	4	1	3

Notes: Harcourt had the highest measured mean annual pH in the province (Figure 2) and the lowest mean annual concentration of ammonium (Figure 4) and sulphate (Figure 5).

HARCOURT 1990

Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ES0 ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.20	32.4	-3.7	.103	.033	.422	.023	.130	.946		1.43	4.6	91.4	10
2	4.42	16.4	-3.7	.041	.014	.140	--	.069	.280	.307	.92	47.0	68.5	20
3	4.04	47.4	-6.6	.016	.017	.254	.002	.242	1.050	.632	2.10	10.6	90.5	20
4	5.24	9.9	.6	.188	.033	.321	.017	.017	.080	.606	.62	68.4	--	13.25.9
5	5.45	7.0	-.4	.328	.015	.093	.015	.007	.050	.225	.93	25.8	18.1	13.18
6	4.45	19.0	-1.9	.201	.012	.149	.014	.092	.210	.167	1.67	32.2	85.2	10
7	4.36	24.8	-3.0	.374	.038	.396	.029	.096	.390	.482	1.88	15.2	69.7	20
8	4.06	35.0	-4.5	.256	.011	.185	.019	.068	.610	.535	1.42	26.8	60.6	10
9	4.15	35.3	-3.6	.560	.054	.360	.024	.052	.630	.885	2.55	5.2	88.2	10
10														4
11	4.43		-4.1	.369	.023	.148	.020	.054	.250	.288	1.18	16.6	95.0	10
12	4.42	18.4	-2.6	.332	.036	.245	.021	.099	.170	.567	1.87	30.8	89.2	10
13	4.66	12.6	-1.6	.367	.025	.159	.024	.072	.040	.313	1.57	12.0	106.6	33
14	4.64	15.8	-2.8	.791	.034	.401	.023	.074	.180	2.04	.91	21.4	88.9	13
15	4.52	23.0	-3.1	.288	.032	.224	.024	.132	.240	.492	1.46	50.0	--	9.25
16	4.06	39.1	-5.2	.302	.036	.292	.030	.144	.480	.200	2.29	19.2	99.0	10
17				1.58	.106	.282	.135		.580	.206	6.69	2.2	88.4	13
18	4.50	12.5	-3.7	.223	.036	.368	.031	.068	.080	.475	1.04	24.0	--	25.9
19	4.76	9.5	-1.7	.144	.034	.287	.029	.063	.080	.338	.76	34.6	101.3	15
20	4.70	14.0	-2.0	.034	.057	.526	.033	.048	.100	.817	.87	45.4	97.1	10
21	5.08	6.8	-1.6	--	.056	.472	.024	.003	.040	.998	.25	42.8	100.8	13
22	6.02	6.6	.5	.211	.015	.069	.026	.026	.050	--	.92	30.6	97.2	10
23	4.05	47.9	-5.3	.469	.074	.312	.314	.456	.620	--	5.80	5.8	99.0	15
24	3.84	83.8	-10.0	.088	.019	.146	.040	.418	.920	.298	7.11	21.2	106.3	10
25	4.48	18.2	-2.8	.055	.021	.163	.021	.165	.230	.187	1.31	52.0	102.6	13
26				.228	.036				.610	.311	5.79	1.8	89.6	15
27	4.16	47.6	-5.7	.150	.033	.086	.039	.336	.430	.304	4.81	7.4	97.8	15
28	4.91	7.6	-1.2	.021	.010	.031	.023	.108	.070	.714	.71	8.8	105.3	10
29	4.42	16.3	-3.2	.042	.013	.049	.023	.057	.210	.195	1.10	27.0	108.8	15
30	4.70	10.4	-1.1	.013	.011	.053	.015	.027	.120	.081	.79	64.0	--	25
31	5.05	5.0	-.5	.023	.013	.067	.012	.000	.060	.281	.31	52.0	106.3	15.13
32	4.98	6.3	-1.0	.015	.012	.087	.036	.048	.100	.227	.46	47.2	--	25.15.9
33	4.41	18.4	-3.2	.039	.008	.050	.007	.003	.160	.230	1.84	33.8	--	25.9
34									.380		.4	187.6	33.19	
35	4.40	16.1	-3.0	.065	.017	.039	.016	.090	.110	.186	1.64	14.4	107.3	15
36	4.31	26.2	-4.4	.063	.023	.183	.017	.132	.350	.340	2.12	14.6	109.0	34
37				.076	.031	.264	.015		.160	.932	.57	1.8	114.5	10
38	4.78	6.4	-2.5	.007	.005	.058	.006	.019	.060	.155	.48	42.2	--	33.25
39	4.05	53.0	-6.8	.098	.026	.131	.034	.688	.480	.311	5.49	10.0	--	15.25.9
40	4.17	38.6	-4.9	.050	.020	.165	.033	.262	.410	.343	3.51	18.4	104.1	13
41	4.35	20.8	-3.9	.042	.041	.334	.033	.095	.230	.559	1.61	31.2	--	16
42	4.27		-4.3	.129	.089	.763	.067	.178	.310	1.160	2.04	4.0	109.4	15
43	4.83	10.5	-1.7	.040	.065	.577	.033	.019	.050	.986	.69	50.6	104.2	15
44	4.45		-3.3	.361	.065	.191	.078	1.770	1.120	.278	5.84	5.8	--	13.25
45	5.30	8.0	-1.7	.035	.039	.281	.023	.040	.040	.597	.69	53.8	90.8	10
46	4.77	11.7	-1.5	--	.029	.293	.020	.077	.120	.404	.71	70.0	87.1	10
47	4.55	28.9	-1.6	.002	.027	.252	.024	.167	.460	.462	1.75	14.0	100.4	10
48	4.70	11.7	-3.2	.036	.025	.218	.011	.047	.190	.333	.63	18.2	87.7	13
49	5.10	6.2	-2.3	.002	.014	.121	.008	.002	.060	.196	.55	41.6	95.0	10
50	4.51	11.9	-4.2	.053	.027	.330	.031	.043	.200	.320	.70	30.6	87.3	10
51	4.60	8.0	-3.9	.018	.008	.274	.037	.020	.110	.040	.49	103.2	--	16
52	4.58	13.3	-2.9	.058	.010	.233	.024	.024	.200	.108	.73	25.4	84.7	13

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Parameter analyses, including some not listed above (i.e. field and laboratory comments, SO₄, acidity and hardness). Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

SHANNON 1990

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 40' 15"	66° 00' 55"	122 m	50% Forest 40% Pasture 5% Homestead 5% Orchard	80 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ ⁺)
1442.7	1.360	1.292	0.180 - as N	0.087
Deposition:	20.258	19.282	11.648	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.546	15.519 $\mu\text{S}/\text{cm}^2$	1.816	-2.317	0.434

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.499	0.290	0.034	0.121	0.059

Data Completeness/Representativeness.

Criteria	Winter	Spring	Summer	Fall
% Valid Samples	100	92	86	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	100	100	100	100
% Collection Efficiency	71	95	80	102
% Sea Salt	7	4	2	5

Notes: The highest mean annual concentrations of potassium in the province were found at Shannon.

SHANNON 1990

Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ES0 ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.33	27.7	-2.7	.171	.079	.715	.056	.168	1.22	1.30		4.7	109.4	16
2	4.84	9.8	-1.7	.097	.045	.483	.168	.020	.150	1.04	.54	55.2	--	12.15.16.20
3	4.10	48.9	-5.5	.178	.070	.742	.038	.276	.930	.978	2.88	24.4	71.6	12.20
4	4.79	12.6	-1.4	.158	.054	.398	.033	.030	.130	.790	.84	70.5	63.0	15
5	5.02	12.5	-.5	.637	.024	.095	.018	.031	.160	.337	1.78	4.9	76.9	12.15.20
6	4.22	29.8	-3.8	.238	.033	.294	.015	.137	.420	.261	2.15	36.3	99.6	20
7	4.81	11.9	-1.3	.259	.019	.167	.063	.018	.130	.161	1.16	15.4	83.1	15
8	4.37	20.9	-2.4	.154	.031	.301	.026	.069	.330	.711	1.39	32.9	51.0	18
9	4.20	35.5	-3.3	.517	.085	.626	.065	.180	.730	1.04	2.69	8.2	77.3	10
10												--	--	4
11	4.32	22.3	-4.7	.326	.014	.210	.022	.184	.310	.629	2.40	26.2	103.7	15
12	4.41	19.5	-2.8	.563	.051	.316	.029	.093	.230	.792	1.62	27.0	90.8	10
13	4.70	11.0	-1.3	.327	.031	.091	.025	.044	.040	.156	1.08	21.9	88.8	10
14	4.61	14.5	-2.6	.200	.036	.307	.028	.058	.180	1.75	.98	29.2	107.4	10
15	4.32	32.3	-4.1	.410	.049	.352	.025	.119	.330	.501	2.46	40.0	--	20.16
16	4.08	37.0	-5.0	.245	.052	.459	.040	.203	.510	.701	2.33	12.1	108.6	10
17				1.28	.104	.200	.063	.670	.480	.115	5.75	2.1	101.9	10
18	4.82	10.7	-1.3	--	.029	.265	.022	.045	.070	.773	.99	6.7	63.0	10
19	4.70	10.9	-1.6	--	.027	.234	.022	.049	.070	.352	.96	85.0	71.7	10
20	5.33	5.0	-.6	.195	.017	.068	.021	.007	.100	.329	.57	65.2	102.2	15
21	5.44	4.1	-.3	.157	.014	.068	.019	.006	.070	.249	.47	32.5	--	17.15
22	5.83	5.7	-.0	.223	.018	.096	.044	.015	.050	.397	.92	42.1	--	16
23	4.04	47.2	-5.3	.498	.053	.212	.087	.138	.510	.278	4.79	5.8	100.5	15
24	4.13	43.5	-5.1	.137	.024	.121	.040	.268	.620	.222	3.44	6.4	83.6	10
25	4.14	44.2	-4.6	.137	.027	.174	.062	.294	.610	.390	3.44	19.5	--	15.16
26	4.68	9.9	-1.7	.035	--	.052	.069	.082	.256		.78	24.8	122.0	13.19
27	3.83		-9.6	.193	.070	.447	.074	.409	.710	.888	6.93	6.2	34.5	33.18
28												--	--	4
29	6.63	34.9	6.5	.468	.157	.080	1.860	1.640	.290	.821	2.06	4.6	92.6	20.15
30	5.13	5.3	-.4	.029	.010	.034	.027	.000	.030	.087	.51	141.6	--	34.25.16.15.13
31	5.67	2.7	.5	.031	.012	.070	.065	.086	.040	.120	.16	31.9	104.2	15.13
32	4.33	20.0	-2.2	.024	.027	.192	.012	.078	.180	.367	1.71	28.6	96.7	15
33	3.83	53.2	-10.0	.046	.015	.042	.012	.655	.380	.098	5.91	12.0	99.0	10
34												--	--	4
35	4.89	20.2	-1.6	.171	.054	1.33	1.120	.450	.250	1.910	2.20	14.8	--	15.9.25
36	4.38	22.1	-3.6	.125	.017	.125	.019	.190	.160	.331	2.33	30.9	92.3	13
37	4.37	26.9	-3.5	.098	.052	.396	.025	.286	.290	.975	2.55	9.0	79.4	10
38	4.91	8.2	-1.1	.021	.013	.098	.005	.144	.070	.125	.80	49.6	--	16.25.33.34
39	4.14	41.0	-5.4	.068	.036	.169	.031	.412	.620	.269	3.36	4.6	91.2	20
40	4.01	42.7	-6.1	.113	.038	.190	.042	.385	.630	.328	3.45	12.2	94.9	10
41	4.17	27.4	-5.5	.069	.074	.710	.055	.085	.210	1.050	2.20	40.3	119.9	13.19
42	4.71	13.7	-2.0	.141	.092	.537	.117	.000	.060	.901	.87	29.3	98.1	10
43	4.40	15.0	-3.8	.195	.104	.554	.110	.000	.040	.947	.82	48.5	--	22.15
44	4.80	14.0	-1.6	.059	.028	.225	.027	.125	.140	.393	1.47	38.6	86.9	20
45	5.57	11.9	-.3	.063	.092	.817	.049	.044	.080	1.650	.71	13.4	106.2	10
46	4.87	8.7	-1.5	--	.011	.124	.018	.105	.100	.082	.71	81.6	87.1	20
47				.027	.044	.352	.044		1.080	.543	5.35	9.6	--	33.9.25
48	5.21	8.5	-1.2	.009	.029	.303	.015	.002	.080	.348	.51	25.0	98.2	10
49	5.00	8.7	-2.5	.022	.030	.443	.117	.002	.080	.612	.64	47.0	--	25
50	4.35	13.4	-5.7	.052	.029	.246	.022	.048	.180	.282	.92	15.0	92.5	13
51	4.39	16.8	-4.8	.073	.034	.431	.038	.056	.210	.371	.99	32.4	93.4	15.13.34.20
52	4.37	19.2	-3.7	.054	.036	.529	.046	.050	.180	.397	1.27	98.0	62.7	15.20.34

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Parameter analyses, including some not listed above (i.e. field and laboratory comments, SO₄, acidity and hardness). Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

TRACY 1990

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 39' 40"	66° 43' 30"	35 m	40% Forest 35% Hay 15% Homestead 10% Pasture	68 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ ⁺)
1374.7	1.421	1.371	0.199 - as N	0.096
Deposition:	19.533	18.841	11.695	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.490	17.271 $\mu\text{S}/\text{cm}^{-2}$	2.021	-3.009	0.374

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.458	0.199	0.024	0.110	0.023

Data Completeness/Representativeness.

Criteria	Winter (wks 49-9)	Spring (wks 10-22)	Summer (wks 23-36)	Fall (wks 37-49)
% Valid Samples	100	92	100	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	100	100	100	100
% Collection Efficiency	83	101	99	98
% Sea Salt	4	3	1	5

Notes: None.

TRACY 1990

Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.18	31.3	-3.6	.132	.027	.292	.020	.150	.436		1.73	3.0	--	19.16
2	4.31	20.9	-4.0	.130	.017	.150	--	.086	.380	.419	1.04	27.0	89.0	15
3	3.96	59.3	-7.5	.146	.028	.308	.009	.309	1.130	.733	3.36	13.4	93.4	10
4	4.65	12.7	-1.4	.203	.018	.157	.020	.037	.140	.474	1.12	40.8	99.7	12.13.20
5	5.43	6.1	-.2	.179	.008	.063	.012	.034	.080	.363	.68	40.6	38.1	12.13.18
6	4.24	28.4	-3.8	.204	.010	.077	.018	.164	.340	.043	2.16	32.8	101.8	10
7	4.53	17.0	-2.1	.232	.014	.116	.013	.061	.220	.165	1.35	18.2	--	25
8	4.47	18.0	-1.8	.172	.013	.203	.020	.062	.300	.375	1.22	27.8	67.8	16
9	4.03		-4.8	1.05	.105	.816	.042	.173	1.060	1.81	4.15	4.4	51.1	18
10														4
11	4.23	22.1	-5.4	.210	.019	.249	.030	.121	.330	.675	2.05	22.4	105.5	13
12	4.27	26.4	-3.5	.474	.038	.249	.025	.156	.350	.480	2.19	22.4	97.6	10
13	4.68	11.4	-2.1	.484	.013	.150	.021	.049	.040	.245	1.28	11.2	78.8	10
14	4.66	11.9	-2.5	.238	.036	.301	.035	.095	.140	.511	.75	34.6	106.1	15
15	4.35	24.9	-3.4	.332	.043	.252	.023	.162	.310	.537	1.69	46.4	103.1	15
16	4.21	28.8	-3.6	.269	.021	.161	.018	.105	.320	.196	2.03	23.2	100.4	15
17									.750	.169	7.24	1.2	83.1	10
18	4.73	10.4	-2.1	.024	.018	.067	.012	.055	.080	.117	1.02	13.6	101.0	10
19	4.81	10.2	-1.2	.039	.064	.634	.045	.058	.070	1.03	.73	55.4	97.9	10
20	4.65	12.3	-1.8	.051	.016	.089	.018	.042	.150	.099	.96	44.6	97.5	10
21	5.18	4.1	-.8	.194	.005	.064	.014	.00	.010	.207	.68	46.0	--	29
22	5.68	6.0	-.2	.215	.009	.098	.019	--	.030	.241	.82	44.6	100.9	10
23	4.36	32.9	-2.7	.106	.019	.093	.039	.289	.400	.065	2.96	12.2	103.5	15
24	3.72	120.5	-14.0	.111	.019	.199	.044	.516	1.140	.254	9.30	16.0	104.8	10
25	4.46	21.4	-2.9	.048	.003	.037	.062	.129	.220	.206	1.84	38.2	122.0	13.15.19
26	4.26	32.2	-3.8	.075	.006	.042	.057	.247	.270	.186	2.98	16.4	101.2	15
27	4.27	25.4	-2.8	.064	.023	.080	.014	.213	.270	.575	2.16	5.2	100.9	10
28				.080	.029	.168	.014		.210	.246	1.24	1.1	152.0	15.19
29	4.20	31.9	-3.5	.018	.018	.058	.019	.105	.260	.070	2.74	14.8	100.8	10
30	4.73	10.0	-1.3	--	.010	.037	.014	.037	.160	1.920	.60	48.0	103.7	15
31	4.96	5.1	-.9	.029	.012	.056	.017	.027	.060	.313	.34	21.2	102.7	15
32	4.46	15.2	-2.2	.015	.015	.120	.013	.032	.080	.338	1.31	38.4	--	15.16
33	3.95	48.3	-5.6	.058	.014	.051	.016	.583	.300	.418	5.30	24.0	101.1	10
34	4.42	17.5	-1.9	.092	.018	.079	.012	.391	.290	.244	1.42	6.4	106.6	10
35		29.3		.122	.020	.110	.011	.535	.480	.287	2.24	16.0	101.8	9
36	4.37	15.2	-2.9	.071	.036	.272	.010	.041	.160	.567	1.15	15.0	100.4	13
37	4.65	11.4	-2.4	.071	.031	.406	.032	.109	.100	.495	.93	34.4	105.3	10
38	4.67	8.8	-2.5	.067	.011	.066	.012	.029	.030	.323	.81	36.6	99.5	34
39	4.00	56.9	-7.4	.066	.038	.159	.036	.550	.640	.287	5.17	9.0	96.8	13
40	4.26	27.6	-4.4	.049	.032	.288	.028	.184	.330	.570	2.29	21.4	97.8	10
41	4.21	26.3	-31.0	.065	.028	.180	.029	.113	.240	.455	2.32	20.6	95.3	15
42	4.64	22.4	-11.0	.097	.189	1.500	.075	.079	.100	2.900	1.13	17.0	106.2	13.15
43	4.78	9.8	-1.5	.039	.022	.217	.019	.040	.050	.361	.78	69.8	104.6	13.20
44	4.17	38.6	-4.7	.271	.027	.098	.034	.441	.770	.310	3.30	4.0	108.5	15
45	4.69	7.8	-2.3	.024	.023	.166	.022	.033	.060	.329	.63	45.0	97.4	15
46	4.56	12.6	-2.2	.031	.009	.071	.018	.069	.230	.202	.86	43.6	75.7	10
47	3.99	58.5	-6.1	.114	.150	1.120	.064	.402	1.010	2.370	3.13	5.0	136.3	19
48	4.84	10.9	-1.0	.006	.047	.321	.019	.036	.150	.638	.56	17.0	84.6	10
49	5.42	9.6	-.6	.042	.039	.348	.021	.019	.110	.437	.59	54.2	100.0	10
50	4.96	7.7	-1.1	.013	.011	.088	.011	.016	.140	.088	.50	46.4	94.6	10
51	4.53	11.1	-3.1	.030	.017	.198	.023	.029	.140	.318	.73	93.0	99.2	10
52	4.36	20.0	-3.3	.030	.007	.040	.013	.045	.370	.154	1.04	11.2	85.4	10

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

SOUTH OROMOCTO LAKE 1990

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 26' 40"	66° 39' 00"	130 m	65% Forest 30% Lake 5% Fish Farm	58 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ +)
1460.6	1.429	1.352	0.182 - as N	0.092
Deposition:	24.499	23.188	13.354	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.509	16.953 $\mu\text{S}/\text{cm}^2$	1.962	-2.895	0.475

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.594	0.312	0.037	0.129	0.032

Data Completeness/Representativeness.

Criteria	Winter (wks 49-9)	Spring (wks 10-22)	Summer (wks 23-36)	Fall (wks 37-49)
% Valid Samples	100	92	86	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	100	100	100	100
% Collection Efficiency	93	103	103	99
% Sea Salt	7	4	1	8

Notes: None.

SOUTH OROMOCTO LAKE 1990

Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.18	34.0	-3.6	.185	.069	.437	.045	.148	.790	.784	.93	6.7	--	13.17
2	4.37	25.7	-3.1	.237	.041	.573	.054	.103	.420	1.49	1.56	18.0	133.8	19
3	3.95	60.3	-8.3	.279	.057	.628	.037	.319	1.200	.770	3.38	14.0	--	17
4	4.91	11.1	-.7	.175	.045	.344	.029	.034	.100	.757	.81	85.3	--	17
5	4.66	7.8	-2.9	.213	.015	.067	.014	.020	.100	.237	.65	19.1	--	17
6	4.29	28.2	-3.2	.218	.009	.120	.023	.144	.380	.325	2.32	31.5	100.0	13.17
7	4.56	20.8	-2.1	.307	.062	.484	.020	.079	.440	.819	1.33	23.8	99.2	17
8	4.57	15.8	-1.5	.179	.019	.203	.061	.051	.220	.313	1.23	30.4	100.4	13.17
9	3.98	68.3	-5.6	.757	.254	2.86	.098	.444	1.100	2.91	4.34	5.4	--	17
10													--	14
11	4.31	25.2	-4.6	.421	.031	.563	.050	.151	.340	.578	2.23	28.5	99.9	10
12	4.27	23.5	-4.0	.500	.056	.335	.032	.123	.845		1.94	24.4	97.7	10
13	4.71	9.7	-2.1	.334	.025	.156	.030	.045	.050	.458	1.00	29.6	98.9	10
14	4.39	26.7	-3.9	.660	.056	.390	.036	.144	.310	.770	1.70	25.2	--	17
15	4.32	28.0	-4.0	.282	.063	.503	.032	.100	.290	1.08	1.97	54.6	101.5	10
16	4.15	36.8	-4.6	.217	.031	.244	.032	.217	.380	.216	2.64	28.6	102.4	13
17	4.41	41.8	-1.7	1.00	.099	.413	.074	.670	.470	.826	4.74	4.2	98.6	10
18	4.72	8.7	-1.8	.045	.015	.105	.020	.056	.070	.073	.86	18.0	102.7	10
19	4.70	13.3	-1.7	.045	.080	.795	.051	.063	.070	1.34	.86	91.4	103.1	13
20	4.50	15.1	-2.2	.226	.009	.093	.055	.020	.150	.176	1.62	42.5	--	17
21	5.85	5.3	--	.204	.007	.043	.057	.00	.010	.218	.81	35.4	--	29.19
22	4.75	7.1	-2.0	.233	.016	.093	.041	.000	.030	.356	.95	57.0	--	13.15.30
23	4.25	40.7	-3.9	.127	.025	.111	.033	.351	.420	.246	3.92	12.2	104.9	13
24				.208	.046	.305	.066		1.800	.628	11.10	1.4	103.2	10
25	4.43	23.9	-2.9	.051	.003	.044	.025	.135	.270	.344	1.92	34.0	--	9.16
26	4.34		-2.9	.157	.028	.062	.039	.177	.280	.133	2.62	4.2	87.5	10
27	4.01	47.8	-5.3	.107	.038	.151	.050	.432	.350	.302	5.05	7.2	91.8	10
28													--	4
29	4.07	44.5	-5.5	.070	.020	.102	.016	.144	.280	.251	4.14	6.6	100.9	10
30	4.92	5.3	-1.0	.021	.006	.028	.007	.024	.060	.300	.49	152.5	106.1	15.13
31	5.11	3.9	-.5	.045	.018	.061	.014	.008	.050	.154	.25	18.4	103.2	10
32	4.32	25.6	-2.6	.026	.021	.160	.011	.032	.210	.402	2.19	43.4	104.1	10
33	3.80	68.1	-9.4	.070	.015	.053	.023	.738	.470	.570	7.43	14.2	99.1	10
34													--	4
35	4.10	29.8	-5.3	.092	.017	.105	.012	.487	.260	.228	2.78	37.2	93.1	10
36	4.46	19.9	-2.5	.062	.037	.316	.018	.271	.130	.552	1.62	28.2	98.4	10
37	4.51	18.1	-3.2	.095	.053	.438	.031	.172	.170	.662	1.47	37.4	104.3	10
38	4.84	8.2	-1.3	.062	.013	.082	.018	.032	.020	.182	.78	55.7	--	17.20
39	4.08	43.1	-6.6	.041	.027	.183	.025	.312	.480	.340	3.71	15.4	--	16
40	4.20	35.1	-4.8	.085	.057	.411	.056	.251	.470	.699	2.59	29.3	102.4	10
41	4.67	10.3	-10.0	.076	.044	.313	.032	.037	.060	.528	1.00	80.1	96.8	10
42	4.50	29.4	-15.0	.155	.258	2.150	.124	.147	.160	4.120	1.26	10.0	99.2	10
43	5.00	7.6	-.9	.037	.023	.203	.024	.033	.030	.403	.60	84.2	110.0	10
44	4.09		-6.3	.707	.077	.233	.066	.674	1.290	.418	5.34	3.6	94.0	10
45		9.24	-1.6	.041	.049	.365	.031	.033	.050	.800	.77	63.0	95.6	10
46	4.50	11.6	-2.6	.026	.012	.102	.038	.043	.200	.259	.73	47.9	72.5	10
47	3.99	58.3	-6.0	.160	.219	1.900	.114	.362	.960	3.110	2.97	9.0	113.7	10
48	4.64	17.3	-1.5	.047	.119	.935	.059	.044	.200	2.030	.78	12.4	100.5	10
49	4.90	12.1	-2.1	.025	.057	.519	.029	.011	.120	.722	.63	72.9	--	16
50	4.72	18.8	-1.9	.086	.038	.351	.029	.078	.320	.565	1.29	43.6	88.5	10
51	4.59	14.0	-2.8	.052	.035	.400	.037	.036	.170	.549	.93	101.4	98.4	10
52	4.41	17.5	-4.1	.040	.019	.229	.028	.034	.310	.493	1.00	15.5	96.6	10

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

LAKEWOOD HEIGHTS 1990

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 18' 30"	65° 58' 30"	82 m	40% Residential 30% Lawn 25% Forest 5% River	7 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ +)
1443.6	1.970	1.800	0.196 - as N	0.094
Deposition:	28.763	26.180	12.514	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.452	22.883 $\mu\text{S}/\text{cm}^2$	2.234	-2.495	0.683

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
1.104	0.670	0.081	0.147	0.047

Data Completeness/Representativeness.

Criteria	Winter (wks 49-9)	Spring (wks 10-22)	Summer (wks 23-36)	Fall (wks 37-49)
% Valid Samples	100	92	79	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	100	100	100	100
% Collection Efficiency	78	85	52	94
% Sea Salt	12	4	2	13

Notes:

This station, situated in the eastern suburbs of the city of Saint John, shared the lowest annual volume weighted mean pH with the Pennfield site (Figure 2). This site had the highest annual mean for hardness, as well as the greatest annual concentration and deposition of sulphate (Figures 5 & 7).

LAKEWOOD HEIGHTS 1990

Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.34	44.7	-2.6	.615	.277	2.38	.102	.134	.640	5.02	1.82	5.4	92.0	10
2	4.71	10.8	-1.5	.213	.028	.282	.011	.031	.120	1.27	.90	30.3	--	17
3	3.74	123.7	-11.0	.422	.412	3.86	.187	.705	2.290	5.36	6.68	10.0	69.3	17
4	4.60	19.9	-1.6	.220	.090	.858	.025	.033	.080	1.23	1.44	53.8	86.4	12.20
5	4.84	13.1	-1.2	.163	.070	.379	.025	.028	.210	.685	1.03	--	.0	20.33
6	4.27	30.5	-2.9	.065	.041	.185	.026	.166	.370	.530	2.61	33.2	98.3	10
7	4.39	33.3	-2.3	.244	.212	2.11	.080	.092	.450	2.72	1.27	22.8	84.7	13
8	4.19	36.6	-3.5	.273	.093	.707	.030	.074	.360	1.47	2.77	41.4	39.9	18
9				2.860	.175				1.6	2.58	7.83	7.1	12.8	18
10												--	.0	4
11	4.29	27.6	-3.1	.108	.023	.212	.030	.158	.240	.461	2.33	29.6	93.9	13
12	4.22	35.1	-4.2	.213	.158	1.16	.073	.155	.390	2.54	2.21	18.8	63.8	10
13	4.66	17.5	-1.7	.668	.072	.153	.018	.042	.160	.244	2.21	14.8	30.0	18
14	4.29	33.1	-3.7	.456	.123	.325	.029	.093	.570	.852	2.30	32.9	96.7	13
15	4.32	33.1	-3.6	.307	.052	.284	.025	.115	.180	.628	2.73	53.6	--	16.9.25
16	4.59	30.8	-2.4	.538	.122	.796	.247	.665	.280	1.12	4.13	28.4	102.8	15
17								.710	.688	5.64	1.0	95.6		10
18	4.90	11.3	-1.7	.244	.037	.292	.027	.083	.060	.569	1.03	19.4	106.0	10
19	4.75	13.6	-1.9	.047	.060	.470	.035	.081	.110	.953	1.04	71.8	--	16
20	4.85	9.0	-1.3	.042	.025	.226	.025	.028	.120	.239	.62	57.0	100.8	13
21	5.46	3.3	-.5	.036	.006	.056	.012	.002	.040	.342	.27	34.8	82.4	10
22	5.88	5.8	.9	.203	.015	.167	.070	.011	.040	.145	.89	50.2	--	16.25.9
23	3.97	56.7	-6.3	.359	.064	.288	.134	.279	.620	.472	5.66	12.0	--	16.20
24									1.700			.2	133.1	19
25	4.47	20.2	-2.6	.088	.024	.181	.026	.217	.214		1.73	17.8	99.0	10
26	4.20	32.9	-3.5	.119	.070	.129	.052	.077	.150	.354	3.57	5.6	95.5	10
27	4.17	36.7	-4.0	.181	.063	.285	.056	.252	.300	.535	3.78	6.4	80.4	10
28														4
29	4.21	31.9	-3.0	.098	.056	.203	.024	.095	.230	.313	3.17	8.6	90.7	10
30	4.34	23.7	-2.3	.125	.049	.381	.043	--	.040	.546	2.48	146.6	--	34.25.16.20
31	5.14	5.0	-.4	.056	.028	.145	.014	.003	.050	.337	.31	17.0	99.7	10
32	4.32	21.6	-3.8	.045	.031	.262	.024	.025	.100	.490	2.07	44.4	--	17
33	3.99	62.6	-7.7	.062	.016	.050	.015	.535	.430	.177	6.65	7.8	98.3	10
34												--	.0	4
35	4.10	34.5	-4.3	.163	.070	.173	.026	.379	.350	.501	3.72	7.4	89.3	10
36	4.02	60.7	-6.8	.102	.074	.721	.063	.548	.410	1.120	5.96	25.8	96.8	33
37	4.29	32.8	-3.6	.118	.077	.679	.069	.296	.430	1.060	2.47	10.0	93.2	10
38	4.80	6.3	-1.9	.008	.018	.087	--	.022	.040	.308	.61	59.4	106.6	10
39	4.07	39.1	-5.6	.035	.041	.329	.014	.225	.340	.551	3.50	8.5	--	20.17
40	4.38	32.7	-3.1	.116	.214	1.860	.089	.192	.330	3.170	1.93	29.0	89.7	12.20
41	4.37	28.8	-3.0	.097	.140	1.120	.066	.027	.250	1.950	2.12	40.4	93.9	20.12
42	4.56	33.0	-2.3	.194	.326	2.540	.115	.106	.190	4.600	1.95	4.0	96.6	10
43	4.84	8.2	-1.5	.041	.043	.333	.025	.022	.040	.681	.64	62.8	98.2	10
44	4.36	39.1	-3.8	.165	.183	1.450	.074	.202	.390	3.080	2.44	9.2	112.2	10
45	5.15	11.3	-1.3	.072	.118	1.020	.056	.048	.040	2.110	.57	38.4	102.3	10
46	4.77	9.2	-1.6	--	.013	.112	.022	.072	.120	.154	.55	75.8	--	33.34
47	4.09	49.9	-5.8	.096	.137	1.050	.062	.322	.860	2.160	2.85	8.2	102.7	20
48	4.34	45.9	-4.2	.123	.292	2.920	.115	.137	.320	4.680	2.28	16.0	67.9	10
49	4.58	19.6	-2.0	.052	.133	1.190	.051	.030	.120	1.940	.99	86.0	--	13.16.27
50	4.46	22.3	-2.9	.094	.119	1.030	.052	.076	.240	1.460	1.06	39.2	88.8	10
51	4.47	26.8	-2.5	.097	.134	1.490	.075	.073	.140	1.700	1.54	109.0	85.1	10
52	4.26	30.1	-4.3	.078	.124	1.000	.054	.082	.320	1.350	1.64	24.2	81.8	10

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

BONNY RIVER 1990

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 13' 00"	66° 51' 00"	30 m	40% Pasture 25% Forest 23% Blueberries 10% Homestead 2% Garden	20 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ ⁺)
1636.3	1.490	1.379	0.207 - as N	0.103
Deposition:	24.385	22.569	14.541	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.539	18.597 $\mu\text{S}/\text{cm}^{-2}$	1.951	-2.533	0.472

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.767	0.436	0.053	0.114	0.036

Data Completeness/Representativeness.

Criteria	Winter (wks 49-9)	Spring (wks 10-22)	Summer (wks 23-36)	Fall (wks 37-49)
% Valid Samples	100	85	79	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	100	100	100	100
% Collection Efficiency	81	100	107	96
% Sea Salt	11	4	1	9

Notes: This site had the greatest total annual precipitation (Figure 1).

BONNY RIVER 1990 Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.45	32.1	-2.2	.484	.137	1.290	.232	.166	.610	2.090	1.64	4.6	110.3	13
2	4.19	31.6	-5.0	.271	.059	.601	.051	.169	.490	1.080	1.88	34.4	101.5	10
3	3.92	69.4	-8.2	.263	.165	1.420	.099	.316	1.340	2.140	4.06	16.0	89.0	10
4	4.65	15.7	-1.6	.212	.082	.734	.034	.060	.140	1.240	1.16	94.8	--	16
5	4.97	8.9	-.1	.182	.009	.069	.013	.017	.130	.299	1.09	7.2	74.5	10
6	4.15	37.4	-4.3	.108	.028	.255	.037	.228	.550	.402	2.76	20.4	100.7	13
7	4.31	31.1	-2.9	.264	.089	.707	.069	.124	.690	1.217	1.44	22.8	95.2	13
8	4.58	18.1	-1.5	.162	.021	.207	.030	.083	.310	.391	.92	31.8	63.4	10
9				2.060	.528	3.820	.188	.257	1.500	7.580	5.86	3.4	51.4	18
10												--	--	4
11	4.19	32.7	-4.4	.150	.036	.329	.032	.196	.390	1.410	2.76	29.8	121.5	19
12	4.52	18.1	-2.1	.180	.032	.317	.047	.051	.170	.628	1.62	21.8	97.5	13
13	4.78	9.4	-1.7	.222	.026	.111	.027	.038	.070	.096	1.29	12.8	95.0	13
14	4.41	22.7	-2.7	.202	.080	.346	.027	.065	.250	.595	1.87	49.6	98.7	13
15	4.43	29.9	-3.3	.297	.070	.461	.034	.146	.260	.910	2.36	53.6	103.0	13
16	4.29	43.1	-4.6	.336	.069	.585	.039	.270	.390	.870	3.31	22.8	101.7	10
17												--	--	4
18	4.74	15.2	-1.8	.280	.035	.445	.060	.097	.100	.389	1.40	15.4	100.6	13
19	4.72	13.9	-1.6	.057	.064	.576	.038	.075	.100	.788	1.06	82.6	--	16
20	4.62	13.7	-2.0	.045	.017	.070	.021	.024	.170	.131	1.05	35.2	121.3	19
21	6.19	5.0	1.0	.258	.008	.064	.014	--	.020	--	.74	36.6	99.9	10
22	5.39	8.7	-1.1	.319	.020	.140	.024	--	.040	.389	1.12	46.4	102.9	13
23	4.07	59.2	-6.7	.248	.056	.220	.074	.382	.740	.217	5.52	5.2	102.2	10
24												--	--	4
25	4.33	29.0	-3.5	.052	.005	.053	.060	.226	.280	.161	2.56	61.6	--	16
26	4.28	28.3	-3.5	.144	.025	.088	.057	.153	.330	.574	2.46	6.8	86.4	10
27	3.82	72.6	-8.8	.090	.046	.318	.037	.726	.490	.503	8.03	6.8	85.1	10
28												--	--	4
29	4.37	21.7	-2.8	.037	.024	.085	.027	.094	.230	1.430	.18	8.8	100.0	10
30	5.33	2.9	-.1	--	.008	.023	.013	--	.020	--	.15	154.6	117.9	19
31	5.01	4.7	-.8	.039	.018	.082	.024	.032	.060	.236	.26	16.4	103.6	10
32	4.67	9.9	-1.4	.031	.015	.110	.019	.046	.100	.166	.66	65.6	102.2	10
33				.170	.051	.217	.039	.822	.810	.304	8.42	2.2	96.2	10
34												--	--	4
35	4.26	30.5	-3.3	.133	.031	.093	.029	.583	.340	.237	2.87	19.2	101.4	10
36	4.12	43.3	-4.8	.039	.040	.466	.039	.631	.380	.773	3.85	26.6	98.3	10
37	4.45	21.5	-2.7	.127	.050	.435	.047	.231	.250	.721	1.85	40.8	102.2	13
38	4.89	7.5	-1.1	.077	.022	.146	.015	.036	.020	.310	.64	64.0	103.4	10
39	4.27	33.9	-4.0	.026	.037	.330	.020	.262	.290	.707	3.11	15.2	99.5	10
40	4.35	28.3	-2.9	.051	.090	.719	.038	.221	.400	1.310	1.77	25.8	95.5	10
41	4.58	16.7	-12.0	.061	.068	.552	.040	.076	.150	1.270	1.26	50.4	--	16
42	4.43	24.0	-17.0	.142	.174	1.330	.076	.102	.140	2.620	1.40	8.2	--	16
43	4.85	11.2	-1.0	.045	.056	.443	.029	.040	.030	.780	.91	75.2	--	25.9
44	4.18		-4.8	.298	.037	.153	.040	.336	.800	.350	3.61	2.6	94.8	10
45	4.70	13.4	-1.9	.042	.091	.806	.043	.040	.080	1.360	.73	61.3	102.1	13
46	4.50	14.7	-1.9	.024	.014	.108	.029	.069	.260	.230	.91	40.4	81.9	10
47	3.90	65.7	-7.0	.090	.149	1.380	.072	.511	1.110	2.730	3.56	9.0	119.2	19
48	4.38	41.5	-2.6	.083	.280	2.500	.102	.252	.390	4.680	1.80	5.6	99.9	10
49	4.78	21.0	-1.6	.048	.151	1.280	.060	.042	.160	2.110	.94	92.8	98.5	10
50	4.78	16.8	-2.5	.063	.044	.415	.024	.059	.280	.408	.96	33.4	108.4	10
51	4.52	16.1	-2.9	.049	.043	.477	.032	.045	.240	.755	1.03	79.0	98.5	10
52	4.46	17.4	-3.0	.046	.037	.372	.029	.045	.270	.517	1.02	16.8	91.5	10

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

PENNFIELD "A" 1990

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 07' 40"	66° 39' 30"	65 m	50% Christmas Tree Stand 30% Blueberries 10% Forest 10% Homestead	5.4 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ +)
1527.8	1.854	1.640	0.237 - as N	0.119
Deposition:	28.325	25.054	15.527	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.452	24.001 $\mu\text{S}/\text{cm}^2$	2.222	-3.328	0.682

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
1.543	0.854	0.098	0.130	0.046

Data Completeness/Representativeness.

Criteria	Winter (wks 49-9)	Spring (wks 10-22)	Summer (wks 23-36)	Fall (wks 37-49)
% Valid Samples	100	85	79	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	100	100	100	100
% Collection Efficiency	78	102	102	101
% Sea Salt	12	6	1	13

Notes: This site had the greatest annual volume weighted mean nitrate concentration (as N) and deposition (Figures 6 & 8). Pennfield had the lowest annual volume weighted pH (Figure 2), associated here with both the highest conductivity (Figure 3) and base cation concentrations (Figure 9). The Pennfield station had the highest annual volume weighted mean acidity concentration and lowest alkalinity volume weighted mean (Figures 10 & 11).

PENNFIELD "A" 1990

Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ES0 ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.05	43.6	-7.3	.300	.221	1.94	.095	.155	.670	4.120	1.77	5.2	108.3	10
2	4.36	33.4	-2.8	.425	.123	1.06	.072	.134	.430	2.660	3.41	38.0	93.4	10
3	3.95	78.3	-8.2	.281	.192	1.83	.095	.413	1.560	3.000	4.22	13.8	81.8	10
4	4.56	21.4	-2.4	.279	.134	1.26	.045	.088	.200	2.260	1.21	77.4	70.3	10
5	4.97	9.0	-.8	.170	.036	.214	.020	.014	.100	.582	.81	11.0	--	15.29
6	4.10	46.2	-5.0	.109	.038	.259	.034	.343	.750	.444	3.12	21.0	103.5	10
7	4.03	65.1	-5.5	.375	.248	2.750	.120	.264	1.300	3.820	2.40	24.8	--	9.20.25
8	4.50	18.3	-1.9	.099	.040	.396	.023	.058	.290	.867	.98	33.6	66.5	11.15
9										2.160	13.40	4.4	--	25
10													--	4
11	4.28	33.4	-3.8	.101	.054	.577	.033	.193	.370	1.060	2.66	36.0	99.3	10
12	4.24	28.4	-4.2	.152	.075	.800	.042	.090	.270	1.400	2.12	19.0	102.1	10
13	4.44	18.6	-2.6	.326	.039	.178	.021	.045	.120	.140	1.88	17.0	67.8	10
14	4.43	20.3	-2.7	.234	.080	.349	.024	.073	.210	.717	1.66	35.6	104.4	10
15	4.44	29.2	-3.6	.357	.077	.529	.043	.168	.230	1.050	2.40	54.4	101.0	15
16	4.21	48.4	-5.1	.239	.105	.932	.065	.305	.400	1.710	3.56	22.0	110.5	10
17											.98	.2	168.2	19
18	4.63	18.5	-2.2	.226	.035	.329	--	.100	.080	.452	1.59	17.0	101.3	10
19	4.64	19.5	-1.9	.068	.096	.902	.050	.116	.110	1.870	1.34	87.0	--	16
20	4.40	18.8	-3.0	.084	.038	.255	.023	.039	.150	.290	1.54	36.4	116.9	19
21	6.13	6.1	.5	.244	.009	.022	.015	--	.030	.259	.91	37.0	98.7	10
22	4.79	7.8	-1.1	.298	.021	.143	.051	--	.040	.738	1.03	50.8	103.6	15
23	3.75	104.5	-12.0	.446	.109	.452	.141	.723	1.500	.844	8.37	3.0	101.0	15
24										2.600	.20	137.0	19	
25	4.05	60.8	-6.8	.097	.023	.151	.034	.451	.680	.480	5.06	26.8	94.4	10
26	4.46	22.1	-3.0	.081	.008	.048	.026	.126	.230	.211	1.77	6.4	109.1	10
27	3.97	57.0	-5.7	.059	.065	.520	.034	.512	.430	.817	5.82	9.0	105.1	10
28												--	--	4
29	4.44	20.2	-2.1	.035	.021	.091	.014	.113	.210	--	.58	11.0	97.4	20
30	5.18	4.2	-0.1	--	.014	.059	.011	.011	.020	.011	.28	110.2	--	16
31	4.82	8.3	-1.0	.026	.018	.118	.010	.017	.050	.491	.75	19.8	103.1	10
32	4.60	11.2	-1.8	.020	.026	.210	.011	.055	.100	.392	.80	51.8	101.4	10
33	3.59		-14.0	.129	.033	.123	.027	1.09	1.000	.423	11.61	3.0	101.0	10
34												--	--	4
35	4.03	37.8	-5.4	.156	.028	.110	.016	.535	.360	.271	3.69	6.8	105.1	15
36	3.92	63.8	-7.7	.101	.053	.457	.035	.918	.610	.838	5.93	25.2	102.1	15
37	4.70	12.5	-1.8	.064	.039	.300	.017	.141	.110	.593	1.06	27.0	104.3	10
38	4.67	10.9	-2.5	.056	.045	.409	.024	.059	.040	.830	.85	78.8	103.2	10
39	4.22	40.8	-4.8	.039	.083	.722	.036	.262	.390	1.090	3.32	9.6	99.1	15
40	4.36	35.5	-3.7	.110	.187	1.700	.072	.227	.420	2.840	1.82	23.6	100.7	15
41	4.35	29.9	-20.0	.069	.123	1.070	.056	.114	.290	1.710	1.84	43.0	100.9	15
42	4.63	28.3	-13.0	.155	.283	2.360	.114	.073	.120	4.500	.95	7.2	96.0	15
43	4.62	13.1	-2.7	.046	.069	.633	.036	.055	.060	1.140	.76	70.6	102.0	10
44	4.23		-4.4	.197	.022	.121	.026	.256	.650	.239	3.25	2.8	101.9	10
45	4.57	24.2	-2.1	.066	.186	1.500	.075	.072	.090	3.060	1.27	46.0	103.5	10
46	4.61	11.6	-2.3	.022	.013	.101	.017	.043	.170	.240	.76	43.2	93.2	10
47	3.97	64.0	-6.5	.112	.184	1.740	.074	.442	1.070	2.560	3.50	12.8	105.5	10
48	4.08	50.3	-5.1	.098	.232	2.200	.087	.352	.580	3.650	2.78	4.0	106.5	10
49	4.76	43.3	-1.9	.153	.521	4.480	.173	.045	.160	7.540	1.07	80.6	--	16
50	4.72	15.1	-2.5	.044	.062	.573	.030	.047	.210	.740	.84	57.0	--	25
51	4.39	22.6	-4.5	.064	.103	.929	.052	.061	.210	1.740	1.33	84.0	98.0	10
52	4.43	22.9	-3.6	.074	.081	.931	.067	.050	.320	1.150	1.19	22.8	93.2	10

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

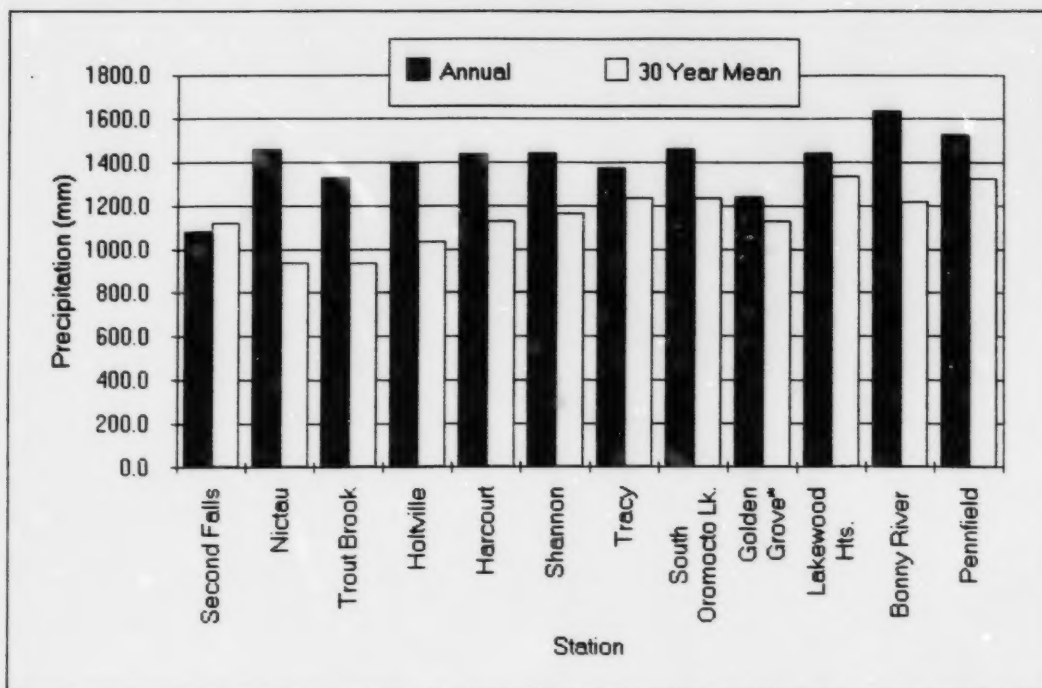


Figure 1. Annual precipitation with 30 year mean (1951-1980) at N.B. D.O.E. precipitation monitoring stations.

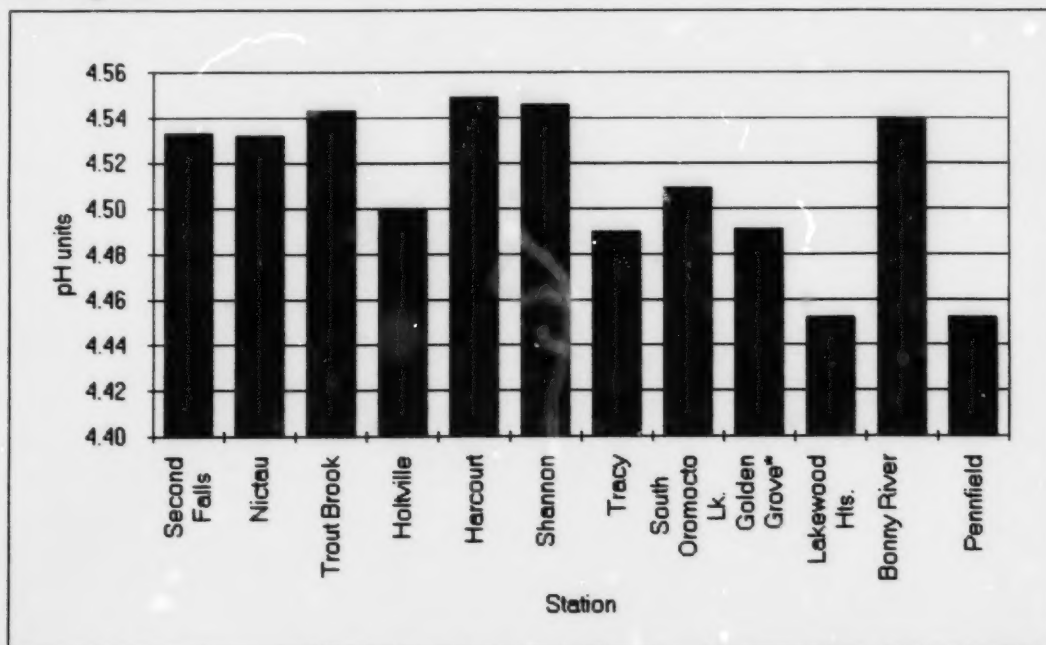


Figure 2. Annual volume weighted mean pH at N.B. D.O.E. precipitation monitoring stations 1990.

* 43 weeks of data only.

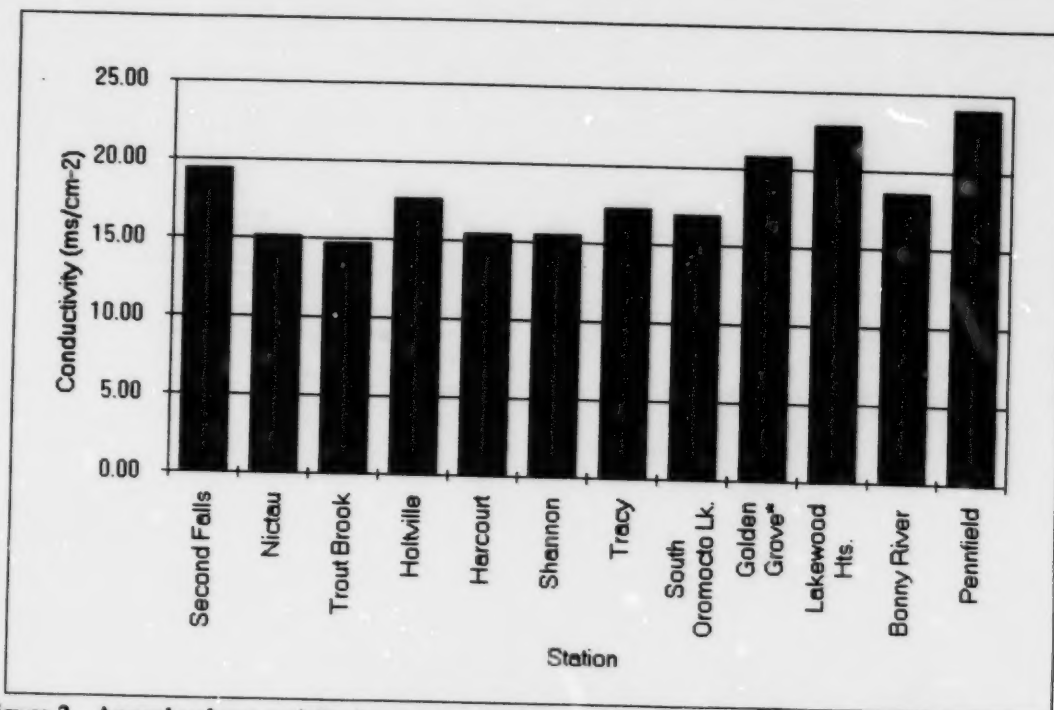


Figure 3. Annual volume weighted mean conductivity at N.B. precipitation monitoring stations.

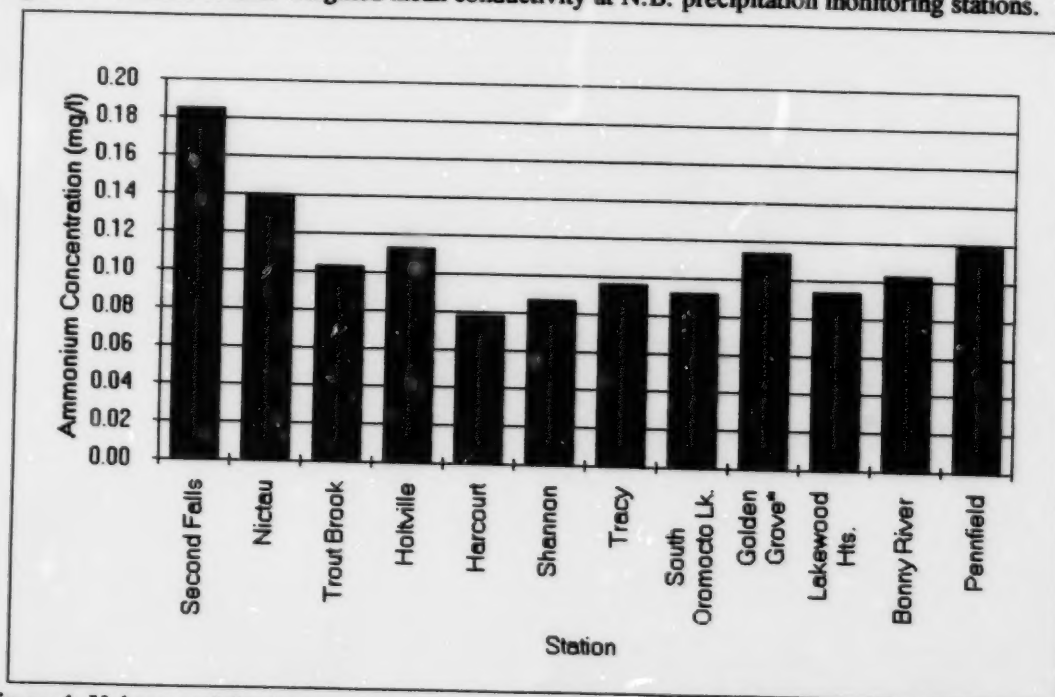


Figure 4 Volume weighted mean ammonium concentrations at N.B. precipitation monitoring stations during 1990.

* 43 weeks of data only.

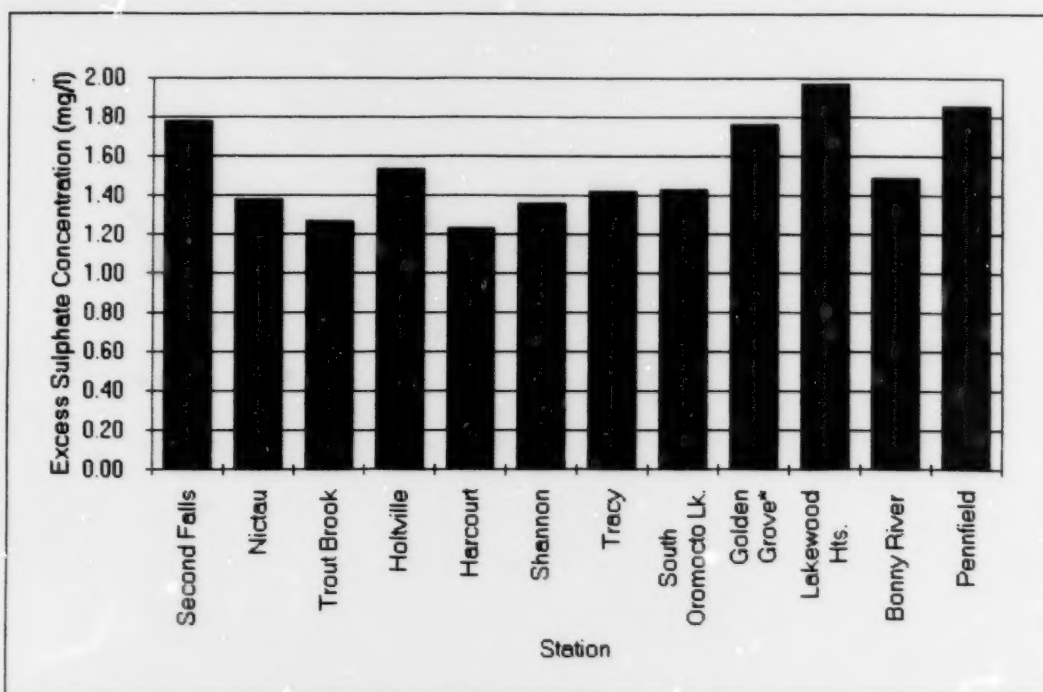


Figure 5. Annual volume weighted mean excess sulphate concentration at N.B. D.O.E. precipitation monitoring stations 1990.

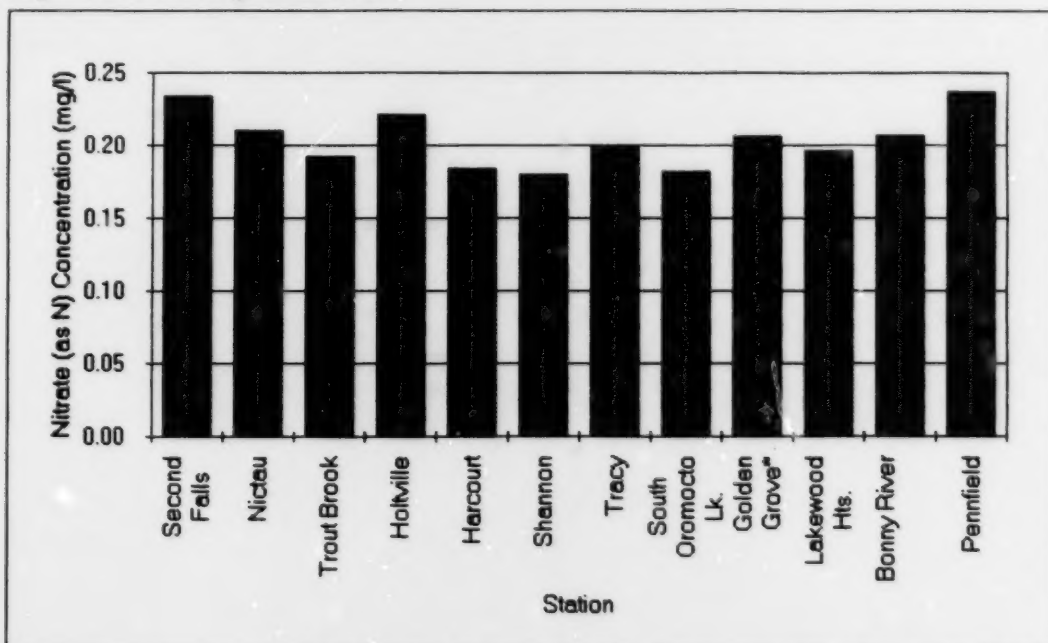


Figure 6. Annual volume weighted mean nitrogen (NO₃-N) concentration at N.B. D.O.E. precipitation monitoring stations 1990.

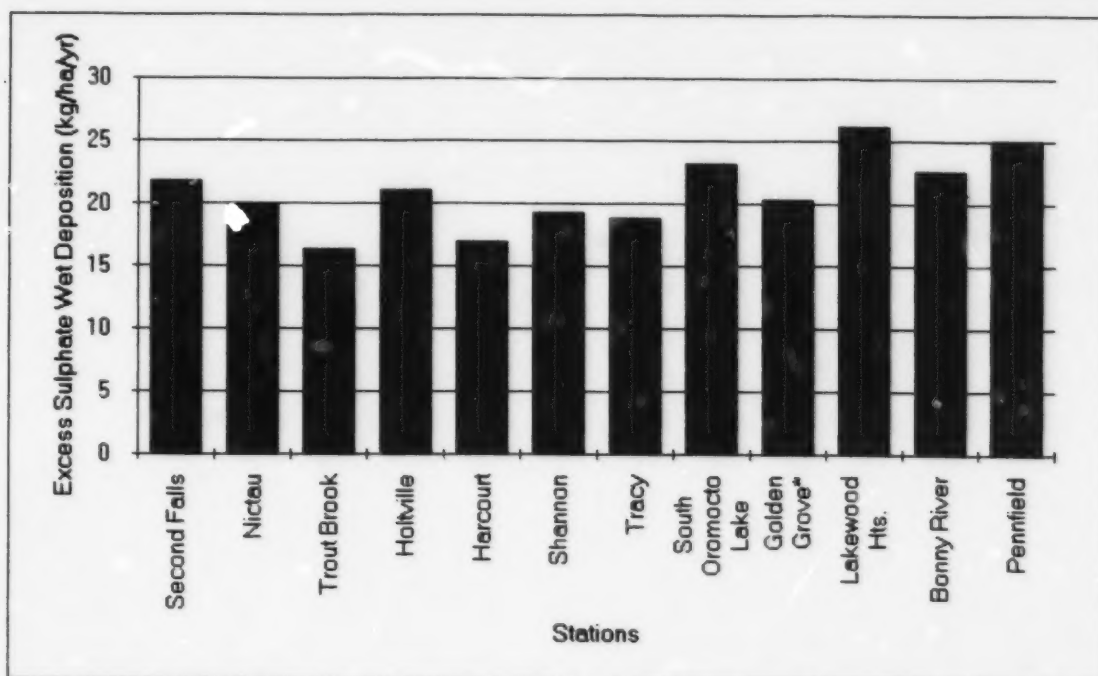


Figure 7. Annual (1990) wet deposition of excess sulphate at N.B. D.O.E. precipitation monitoring stations.

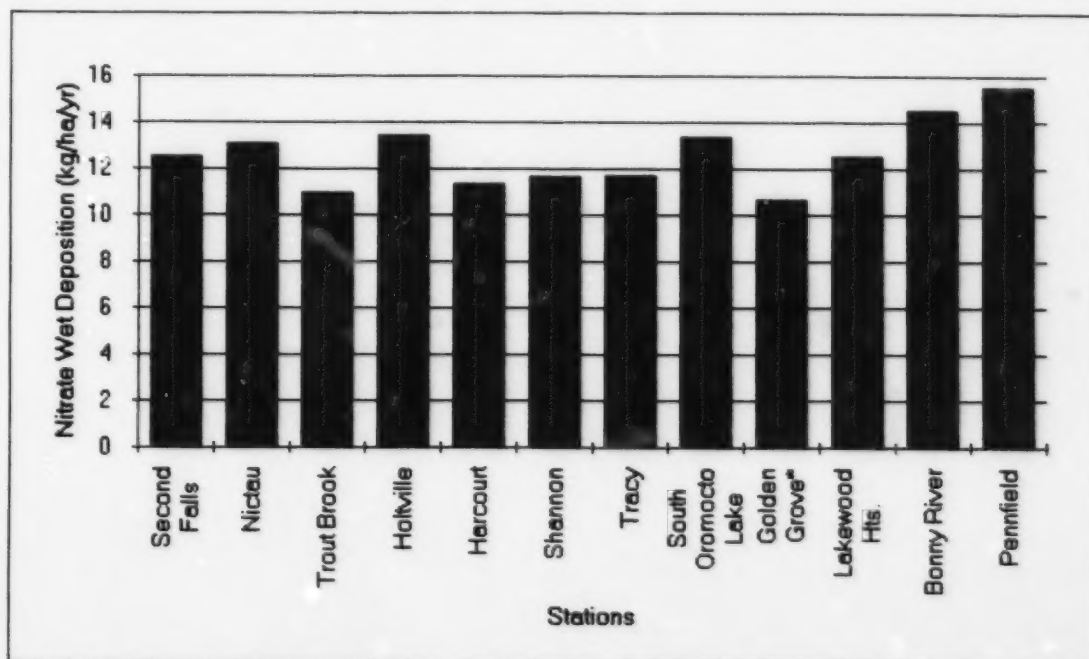


Figure 8. Annual wet deposition of nitrate at N.B. D.O.E. precipitation monitoring stations 1990.

* 43 weeks of data only.

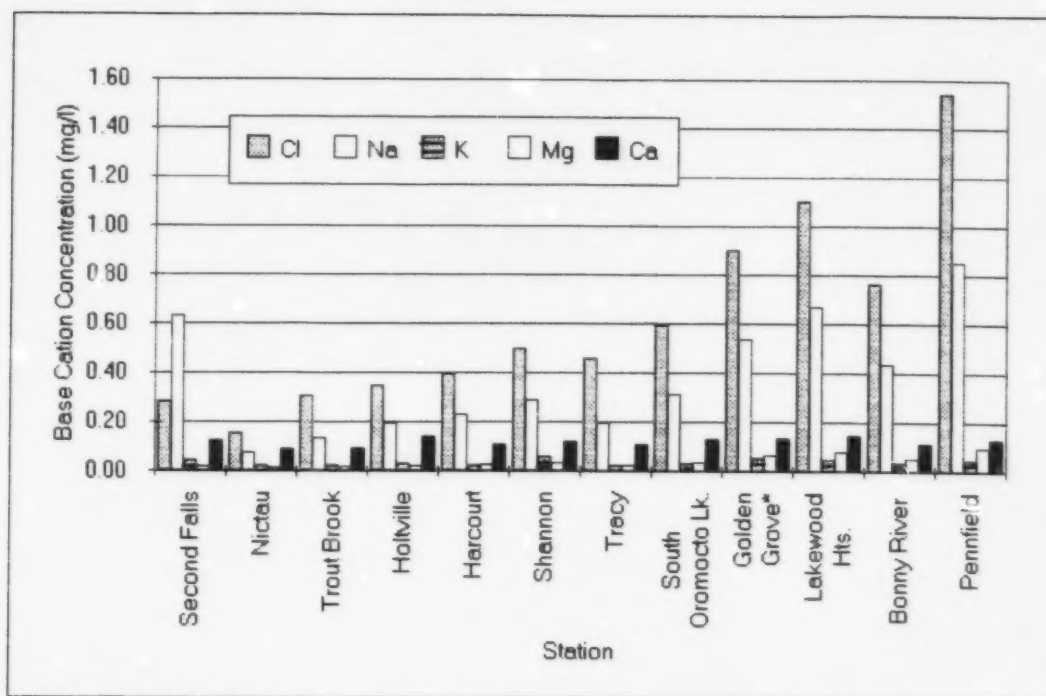


Figure 9. Annual (1990) base cation volume weighted mean concentrations at N.B. D.O.E. precipitation monitoring stations.

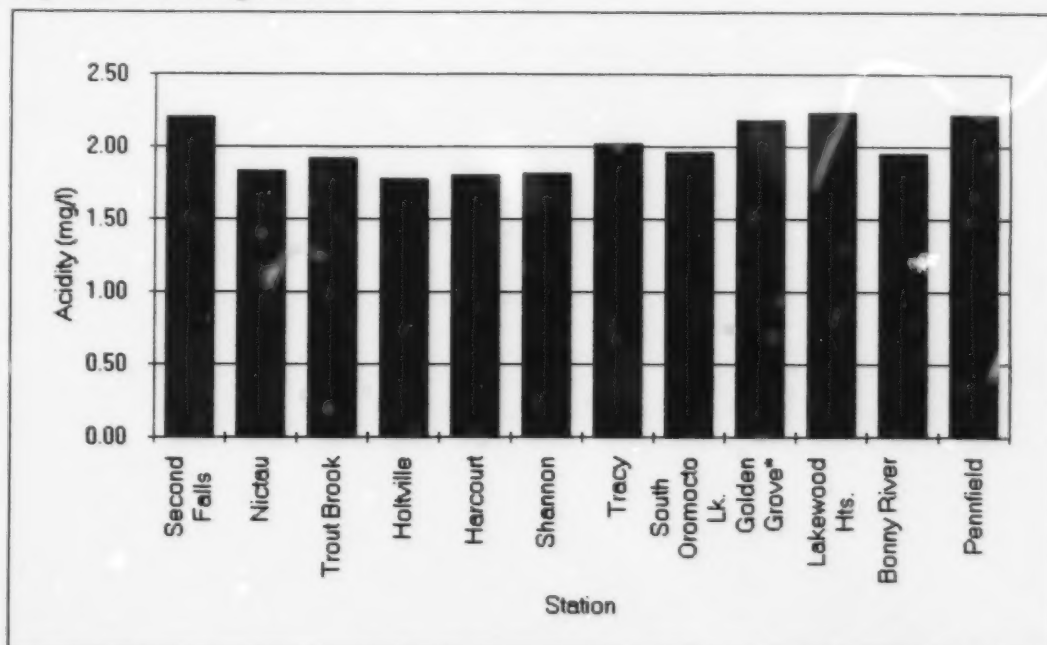


Figure 10. Annual (1990) volume weighted acidity concentration at N.B. D.O.E. precipitation monitoring stations.

* 43 weeks of data only.

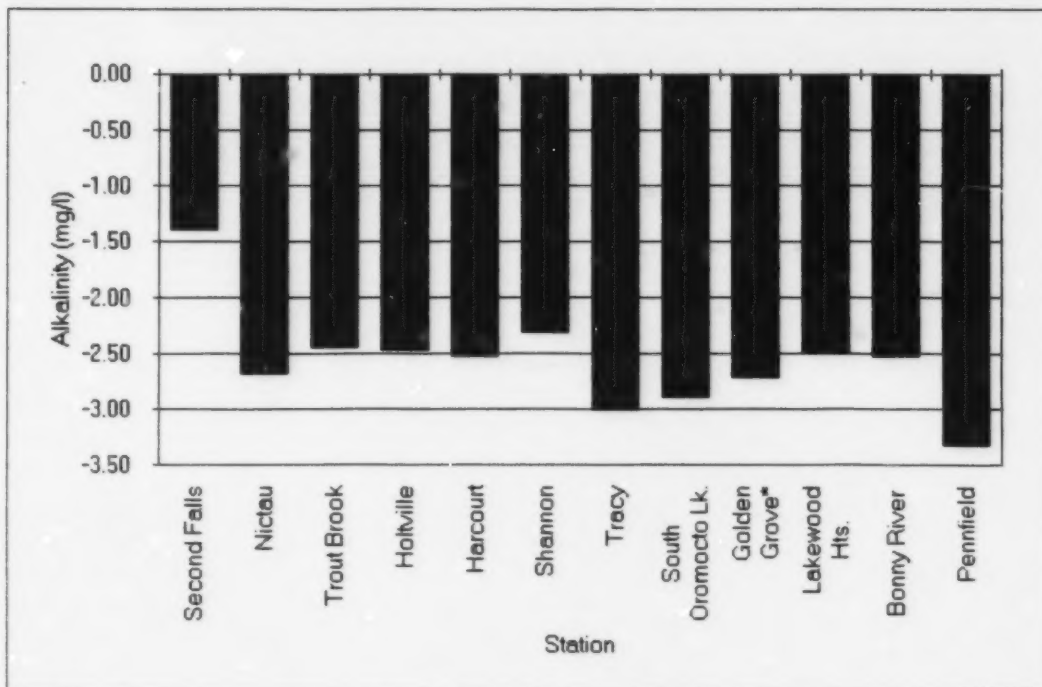


Figure 11. Annual volume weighted mean alkalinity concentration at N.B. D.O.E. precipitation monitoring stations 1990.

PRECIPITATION MONITORING STATION DATA SUMMARY - PARTIAL YEAR OPERATION

43 WEEKS OF OPERATION

GOLDEN GROVE

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 23' 00"	65° 53' 40"	137 m	38% Hay 30% Forest 30% Pasture 2% Homestead	16 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ ⁺)
1241.3	1.762	1.627	0.206 - as N	0.114
Deposition:	21.935	20.322	10.654	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.491	20.810 $\mu\text{S}/\text{cm}^2$	2.183	-2.274	0.559

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.902	0.536	0.066	0.135	0.055

Data Completeness/Representativeness.

Criteria	Winter (wks 49-9)	Spring (wks 10-22)	Summer (wks 23-36)	Fall (wks 37-49)
% Valid Samples	92	85	79	100
% Precip. Coverage	100	100	100	100
% Valid Precip.	100	100	100	100
% Collection Efficiency	72	82	81	85
% Sea Salt	15	5	2	11

Notes: This site terminated operation after 43 weeks of operation during 1990 (January 1 through October 27).

GOLDEN GROVE

Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.37	41.4	-2.8	.390	.206	1.90	.085	.121	.560	3.64	1.73	5.5	133.2	19
2	4.83	13.0	-0.8	.342	.038	.403	.026	.062	.180	.584	.72	45.9	69.7	10
3	3.87	86.8	-7.5	.802	.315	2.84	.488	.326	1.790	3.88	6.06	9.8	83.4	10
4	4.65	19.8	-1.6	.133	.095	.858	.032	.050	.150	1.30	1.30	62.3	83.4	13.20
5	4.56	26.6	-2.1	.209	.190	1.96	.142	.063	.500	2.45	.96	37.8	--	13.16.18
6	4.20	32.4	-3.3	.075	.025	.155	.026	.151	.390	.297	2.64	33.4	100.8	10
7	4.39	29.0	-2.3	.219	.159	1.56	.147	.078	.480	2.17	1.15	27.0	--	9.25
8	4.10	36.1	-4.0	.321	.061	.596	.041	.115	.360	1.80	2.45	40.2	--	9.25
9	4.22	52.0	-4.0	.746	.261	2.45	.093	.115	.880	4.08	3.07	10.4	38.0	18
10												--	--	4
11	4.56	20.3	-1.7	.140	.019	.210	.197	.260	.180	.257	2.22	30.8	86.6	13
12	4.38	29.7	-2.7	.213	.116	1.02	.060	.143	.380	2.16	1.85	20.2	77.9	10
13	5.12	8.4	-1.0	.375	.047	.150	.136	.066	.060	.305	1.27	15.4	55.5	15.33.18
14	4.79	14.2	-1.2	.191	.056	.213	.061	.049	.220	.377	1.15	36.8	94.7	10
15	4.32	34.6	-4.4	.233	.056	.417	.035	.142	.250	.728	2.90	50.4	--	17
16	4.28	42.6	-4.4	.331	.074	.417	.074	.252	.280	.834	4.04	35.3	100.3	13
17											1.39	0.6	43.4	18
18	4.97	10.7	-1.5	.195	.049	.491	.051	.080	.060	.614	.88	19.8	94.5	10
19	4.68	13.8	-2.0	.066	.077	.623	.042	.076	.100	.990	.98	79.0	--	15.17
20	4.73	10.5	-1.4	.046	.024	.172	.037	.034	.120	.199	.75	56.6	100.0	13
21	5.30	3.2	-.4	.043	.007	.058	.017	.002	.040	.311	.22	40.4	94.4	10
22	5.69	6.1	-.2	.217	.048	.133	.090	.247	.060	.237	1.18	49.4	--	15.16.20
23	4.22	39.4	-3.5	.288	.041	.100	.121	.171	.360	.429	3.99	15.4	100.0	10
24												--	--	4
25	4.37	27.5	-3.1	.102	.035	.271	.064	.285	.300	.453	2.40	19.0	93.7	13
26	4.23		-3.6	.165	.043	.063	.059	.045	.150	.223	3.45	3.6	95.0	10
27	4.14	39.8	-4.8	.146	.047	.186	.088	.315	.350	.399	3.95	7.0	89.2	10
28												--	--	4
29	4.11	39.0	-4.6	.084	.050	.130	.048	.157	.250	.592	4.08	8.0	100.5	10
30	4.71	13.5	-1.0	.011	.067	.541	.032	.004	.040	.960	.99	121.0	--	20.9.34.25
31	5.22	4.6	-.3	.048	.033	.098	.033	.000	.040	.214	.30	37.1	107.3	13
32	4.69	11.6	-2.6	.022	.036	.264	.018	.020	.090	.444	.87	46.0	--	16
33	3.86	61.0	-9.8	.064	.020	.077	.014	.690	.510	.326	6.37	8.5	88.2	10
34												--	--	4
35	4.14	26.5	-4.1	.082	.025	.122	.047	.307	.260	.300	2.61	29.8	96.1	10
36	4.06	44.3	-5.8	.086	.041	.423	.035	.428	.320	.563	4.22	29.0	99.9	10
37	4.30	32.1	-3.6	.104	.083	.721	.043	.329	.370	1.140	2.58	16.0	98.0	10
38	4.91	6.6	-1.0	.023	.018	.131	.004	.022	.040	.281	.59	58.8	--	25.20.9
39	4.12	42.4	-5.1	.033	.035	.250	.015	.262	.380	.650	3.85	12.4	84.9	10
40	4.31	32.1	-3.7	.094	.139	1.150	.067	.261	.390	1.940	2.12	34.3	95.8	20.12
41	4.46	24.4	-2.7	.068	.111	.963	.055	.101	.220	1.540	1.71	44.0	98.9	20.15.12
42	4.70	30.1	-1.7	.194	.343	2.740	.179	.005	.170	4.810	1.14	4.2	91.0	15.20
43	4.73	10.4	-1.7	.039	.049	.377	.029	.055	.060	.679	.76	67.2	100.1	34.20

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

PRECIPITATION MONITORING STATION DATA SUMMARY - PARTIAL YEAR OPERATION

20 WEEKS OF OPERATION

MAGAGUADAVIC LAKE

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 43' 45"	67° 09' 30"	49 m	70% Forest 20% Pasture 5% Homestead 5% Lake	70 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ +)
333.0	1.810	1.738	0.240 as N	0.109
Deposition:	7.576	7.275	4.31	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.593	16.853 $\mu\text{S}/\text{cm}^{-2}$	2.233	-2.364	0.534

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
1.204	0.247	0.031	0.181	0.064

Data Completeness/Representativeness.

% Valid Samples	% Precipitation Coverage	% Valid Precipitation	% Collection Efficiency	% Sea Salt
Winter 92	100	100	59	3
Spring 82	100	97	96	6

Notes: This site operated over a 20 week period (January 1 through May 22) during 1990 prior to being terminated.

MAGAGUADAVIC LAKE

Weekly Concentrations and Measurements¹

Week	pH	Cond. µS/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1		34.3		.259	.054	.345	.153	.253	.890	.721	1.92	1.7	--	17
2	4.28	51.1	-3.4	.276	.086	.839	.247	.363	1.150	1.880	2.87	8.4	--	17.20
3	4.04	55.2	-6.9	.086	.019	.247	.022	.352	1.130	.422	2.89	12.5	--	17
4	4.64	14.9	-1.6	.131	.022	.151	.049	.072	.180	1.790	1.56	45.4	87.6	13.17
5	5.27	6.7	-6	.158	.014	.092	.045	.041	.080	4.380	1.02	39.5	22.6	18
6										1.300	8.03	25.2	71.5	13
7	4.54	15.3	-1.9	.125	.009	.090	.021	.033	.200	.104	1.10	11.6	83.3	10
8	4.50	17.6	-2.3	.245	.049	.376	.145	.153	.400	.592	.88	22.1	--	13.17
9										1.090	8.98	1.4	--	16
10												--	--	4
11	4.23	25.4	-6.0	.262	.024	.249	.038	.140	.390	.376	2.26	26.2	131.4	13.19
12	4.58	20.3	-2.5	.425	.039	.183	.031	.138	.240	.407	1.46	25.9	--	17
13	6.35	16.3	.7	.473	.078	1.05	.851	.249	.130	1.980	.96	4.5	89.8	13
14	4.52	18.3	-3.3	.184	.047	.259	.056	.058	.240	.871	1.11	24.3	--	13.25
15	4.70	13.9	-2.2	.289	.028	.277	.040	.102	.130	1.430	1.03	52.7	110.2	20.13.15
16												6.9	193.8	3.14.19
17	4.23	33.7	-4.8	.242	.053	.359	.079	.379	.500	.494	2.86	8.0	184.4	19
18	4.75	11.8	-2.7	.095	.022	.088	.041	.148	.100	.258	1.29	15.0	--	13
19	4.93	10.9	-1.4	.050	.050	.451	.049	.078	.100	.770	.79	47.3	103.9	20
20	4.81	10.0	-1.6	.035	.013	.056	.044	.034	.120	.114	.79	40.0	116.3	34.19

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

JUVENILE SETTLEMENT

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 31' 55"	66° 38' 40"	130 m	60% Forest 30% Pasture 10% Homestead	67 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ +)
459.4	1.660	1.571	0.253 as N	0.172
Deposition:	8.836	8.362	5.777	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.536	17.673 $\mu\text{S}/\text{cm}^{-2}$	1.488	-2.286	0.745

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.631	0.354	0.049	0.217	0.045

Data Completeness/Representativeness.

% Valid Samples	% Precipitation Coverage	% Valid Precipitation	% Collection Efficiency	% Sea Salt
Winter 85	100	100	63	5
Spring 82	100	100	90	5

Notes: This site operated over a 20 week period (January 1 through May 22) prior to termination.

JUVENILE SETTLEMENT

Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.28	28.1	-3.1	.330	.039	.275	.031	.139	.500	.214	1.80	2.4	186.2	19
2	4.91	15.6	-.6	.601	.207	.310	.030	.133	.410	.725	1.81	26.0	94.1	13
3	3.98	60.7	-6.2	.327	.050	.289	.034	.326	1.110	.950	3.91	13.0	79.2	10
4	4.99	11.4	-1.1	.180	.034	.289	.102	.139	.170	.553	1.18	76.0	-. ^a	13.9.25
5	5.32	5.9	-.9	.205	.019	.089	.024	.161	.100	.259	.90	20.4	47.9	18
6	4.21	28.2	-3.7	.291	.008	.130	.022	.177	.350	.302	2.30	30.0	102.1	13
7	4.57	15.0	-2.0	.223	.018	.133	.022	.140	.240	.183	1.30	16.6	99.8	10
8	4.66	15.6	-1.3	.158	.020	.178	.020	.309	.370	.270	1.45	33.0	59.6	16
9	4.06		-5.8	.907	.154	1.30	.083	1.040	2.190	2.140	4.99	2.8	107.1	10
10												-. ^a	-. ^a	4
11	4.34	24.5	-4.0	.189	.037	.371	.047	.283	.410	.728	2.44	26.7	-. ^a	17
12	4.48	22.4	-2.1	.370	.054	.399	.045	.247	.290	.622	2.01	19.4	101.7	10
13	4.84	9.5	-1.7	.110	.012	.140	.049	.116	.030	.842	1.42	14.8	68.8	13
14	4.60	16.7	-2.1	.239	.043	.454	.034	.149	.200	.660	.97	45.4	78.5	10
15	4.42	26.2	-2.8	.248	.060	.524	.037	.135	.290	.634	1.74	47.4	111.9	10
16	4.15	30.8	-4.0	.363	.029	.216	.034	.275	.360	.330	3.73	23.2	105.9	10
17												-. ^a	-. ^a	4
18	4.41	17.2	-2.3	.113	.042	.305	.044	.147	.140	.674	1.80	17.0	106.5	10
19	4.68	12.1	-2.7	.069	.087	.806	.049	.126	.070	1.39	.91	72.0	-. ^a	25.9
20	4.80	8.5	-1.7	.110	.017	.070	.030	.082	.110	.140	.85	46.2	-. ^a	16.17.33

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "-.-". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

WIRRAL STATION

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 30' 40"	66° 28' 30"	38 m	45% Forest 45% Pasture 10% Homestead	65 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ +)
553.3	1.499	1.409	0.237 - as N	0.079
Deposition:	8.296	7.794	5.631	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.511	18.844 $\mu\text{S}/\text{cm}^2$	1.798	-2.076	0.722

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.667	0.368	0.045	0.214	0.036

Data Completeness/Representativeness.

% Valid Samples	% Precipitation Coverage	% Valid Precipitation	% Collection Efficiency	% Sea Salt
Winter 92	100	95	74	7
Spring 91	100	100	96	4

Notes: This site operated 20 weeks (January 1 through May 22) prior to termination during 1990.

WIRRAL STATION

Weekly Concentrations and Measurements¹

Week	pH	Cond. µa/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.24	33.4	-3.2	.225	.071	.910	.032	.112	2.030		1.59	5.0	106.0	10
2	4.50	20.0	-2.2	.180	.050	.633	.027	.076	.340	1.190	1.23	27.4	74.8	10
3	4.01	56.9	-6.6	.143	.053	.509	.020	.258	1.120	.764	3.01	11.6	88.9	10
4	4.89	10.5	.1	.235	.046	.320	.062	.033	.100	.739	1.06	83.9	67.6	16
5	4.89	12.6	-.9	.713	.017	.197	.045	.028	.140	.594	1.75	6.9	55.4	13.18
6	4.33	26.7	-2.9	.228	.014	.173	.033	.081	.310	.400	2.28	31.6	99.9	13
7	4.51	22.2	-2.2	.323	.047	.370	.040	.090	.370	.707	1.47	21.0	76.1	10
8	4.38	21.9	-2.2	.257	.029	.202	.016	.051	.340	.246	1.48	30.6	45.6	18
9	4.09	55.5	-4.2	.823	.197	1.800	.094	.253	1.010	2.290	3.56	7.6	45.9	18
10												.4	77.5	10
11	4.26	23.3	-4.5	.230	.028	.178	.023	.132	.350	.357	2.27	25.8	--	16.13
12	4.25	27.6	-3.6	.607	.064	.455	.035	.140	.330	.831	2.18	24.2	77.0	10
13	4.59	12.3	-2.1	.336	.020	.108	.028	.038	.080	.190	1.44	11.0	133.9	19
14	4.57	19.9	-2.6	.263	.061	.456	.027	.079	.260	.965	1.04	35.6	100.8	10
15	4.41	26.3	-3.1	.251	.047	.362	.025	.129	.290	.523	1.70	46.0	98.9	10
16	4.30	31.2	-3.2	.216	.025	.260	.033	.149	.350	.229	2.14	25.6	100.5	10
17				1.920	.157	.285	.155		.20	.189	6.72	1.6	97.4	10
18	4.77	8.0	-1.4	.065	.025	.139	.026	.055	.070	.208	.86	21.0	93.7	10
19	4.77	11.6	-1.4	.032	.073	.640	.038	.068	.070	1.060	.83	78.8	101.3	10
20	4.91	7.5	-1.3	--	.007	.075	.025	.009	.090	.258	.60	57.7	--	16.20

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DARLINGS ISLAND

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 30' 00"	65° 53' 30"	38 m	30% Forest 30% Mixed Crop 28% Pasture 10% River 2% Homestead	29 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ +)
533.3	1.659	1.561	0.240 - as N	0.094
Deposition:	8.848	8.325	5.49	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.522	20.858 μ S/cm ²	2.177	-2.089	0.554

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.679	0.393	0.047	0.180	0.033

Data Completeness/Representativeness.

% Valid Samples	% Precipitation Coverage	% Valid Precipitation	% Collection Efficiency	% Sea Salt
Winter 100	100	100	79	13
Spring 82	100	100	101	4

Notes:

This site operated 20 weeks prior to termination in 1990.

DARLINGS ISLAND

Weekly Concentrations and Measurements¹

Week	pH	Cond. µa/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.45	40.6	-2.1	.407	.218	1.600	.077	.134	.580	3.020	1.81	6.6	102.0	10
2	4.69	13.4	-1.6	.313	.032	.239	.068	.068	.220	.500	.78	39.9	..	25.9
3	4.22	71.0	-3.8	.273	.151	1.360	.069	.294	1.470	1.930	3.54	15.2	91.2	13
4	4.73	18.2	-1.2	.169	.064	.589	.003	.040	.110	1.270	1.59	70.0	74.5	10
5	5.19	9.0	-.8	.308	.018	.069	.010	.059	.110	.451	1.15	8.6	..	16
6	4.18	35.9	-4.0	.136	.074	.540	.042	.163	.490	1.220	2.51	30.1	100.7	10
7	4.34	29.7	-2.9	.183	.088	.742	.050	.165	.650	1.120	1.32	16.7	97.4	15
8	4.21	26.4	-3.5	.044	.049	.453	.031	.101	.390	.582	1.58	27.7	48.3	18
9	4.18		-2.7	1.460	.198	1.880	.083	.201	.970	3.050	3.99	4.5	47.5	18
10												..	..	4
11	4.35	24.1	-3.1	.144	.018	.190	.021	.133	.210	.334	2.16	21.0	131.7	19
12	4.90	11.1	-.4	.138	.026	.167	.032	.078	.110	.305	1.04	24.2	..	25
13	4.86	10.7	-1.5	.055	.018	.207	.034	.049	.070	.211	1.21	15.6	87.4	17.20
14	4.67	13.5	-1.5	.344	.029	.161	.018	.046	.170	.172	1.18	25.9	104.8	10
15	4.40	30.9	-3.5	.473	.042	.298	.026	.152	.220	.759	2.40	39.5	101.4	10
16	4.32	37.5	-4.3	.193	.036	.390	.036	.188	.240	.517	3.01	27.0	105.5	15
17												..	..	4
18	4.72	15.4	-1.6	.239	.045	.314	.083	.140	.090	.297	1.58	12.4	..	16.15
19	4.59	16.6	-1.6	.051	.047	.408	.037	.070	.100	.537	1.36	70.5	101.5	13
20	4.88	7.7	-1.1	.009	.014	.090	.024	.041	.100	.090	.56	77.9	101.0	20

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "...". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

LONEWATER FARM

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 23' 30"	66° 14' 45"	18 m	30% Forest 30% Hay 30% Pasture & Homestead 10% Marsh	22 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ +)
273.2	1.494	1.390	0.215 - as N	0.107
Deposition:	7.662	7.127	4.723	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.508	18.952 $\mu\text{S}/\text{cm}^2$	1.973	-2.484	0.445

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
0.813	0.407	0.047	0.154	0.033

Data Completeness/Representativeness.

	% Valid Samples	% Precipitation Coverage	% Valid Precipitation	% Collection Efficiency	% Sea Salt
Winter	92	100	100	107	10
Spring	82	100	100	109	5

Notes: This site terminated operation after 20 weeks (January 1 through May 22) of operation.

LONEWATER FARM

Weekly Concentrations and Measurements¹

Week	pH	Cond. µs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.40	42.4	-2.3	.433	.194	1.280	.131	.144	.610	2.710	2.00	9.7	106.4	10
2	4.56	16.4	-2.1	.449	.038	.340	.036	.086	.250	.810	.92	44.0	90.4	10
3	3.96	65.7	-8.3	.270	.147	1.450	.089	.272	1.210	2.220	4.00	9.5	154.8	19
4	4.68	17.6	-1.6	.181	.074	.697	.024	.054	.150	1.220	1.32	49.8	136.7	17.19
5	4.90	11.5	-1.3	.164	.051	.395	.031	.026	.180	.620	.86	10.3	109.8	20.12
6	4.20	35.8	-4.2	.088	.013	.103	.024	.165	.440	.293	2.65	22.0	139.1	19
7	4.42	24.0	-2.4	.129	.097	.862	.055	.071	.400	1.340	1.05	14.2	142.3	19
8	4.39	20.5	-2.7	.138	.043	.401	.024	.064	.340	.528	1.02	33.0	43.3	18
9												-.-	-.-	4.33
10												-.-	-.-	4
11	4.43	17.7	-3.4	.147	.022	.189	.031	.082	.150	.395	1.58	31.0	138.3	19
12	4.28	27.1	-4.2	.262	.076	.744	.040	.106	.330	1.280	1.94	9.5	100.2	10
13	5.13	9.3	-1.0	.420	.036	.295	.095	.089	.110	.495	1.35	14.2	-.-	13.9.25
14	4.43	21.6	-2.6	.103	.030	.307	.028	.093	.280	.275	1.62	56.0	-.-	17
15	4.43	33.8	-3.5	.239	.057	.465	.031	.161	.180	.980	2.93	28.2	-.-	17
16	4.40	30.9	-3.6	.360	.038	.385	.038	.131	.240	.823	2.21	10.0	137.8	33.19
17												-.-	-.-	4
18	5.20	8.4	-1.3	.154	.011	.100	.001	.264	.060	.086	1.08	16.0	139.5	19
19	4.56	13.0	-2.5	.018	.063	.521	.032	.149	.080	1.550	1.07	85.2	-.-	17
20	4.81	7.3	-1.4	.005	.013	.052	.022	.063	.080	.110	.61	70.3	-.-	17

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to insufficient volume). Trace measurements and non-calculated parameters appear as "-.-". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

MUSQUASH

Site Information.

Latitude	Longitude	Elevation	Land Use Type Within 1 km	Distance to Coast
45° 11' 00"	66° 20' 00"	30 m	70% Forest 30% Pasture	5 km South

Precipitation (mm), Volume Weighted Concentrations (mg/l) and Deposition (kg/ha/yr).

Precipitation	Sulphate (SO ₄)	Excess Sulphate (ESO ₄)	Nitrate (NO ₃)	Ammonium (NH ₄ ⁺)
794.3	2.120	1.888	0.299 - as N	0.125
Deposition:	16.839	14.996	10.183	

Acidity and Related Volume Weighted Concentrations (mg/l).

pH	Conductivity (Cond.)	Acidity - Grans	Alkalinity (Alk.)	Hardness
4.405	27.664 $\mu\text{S}/\text{cm}^2$	2.515	-2.863	0.874

Base Cation Volume Weighted Concentrations (mg/l).

Chloride (Cl)	Sodium (Na)	Magnesium (Mg)	Calcium (Ca)	Potassium (K)
1.566	0.957	0.106	0.236	0.055

Data Completeness/Representativeness.

	% Valid Samples	% Precipitation Coverage	% Valid Precipitation	% Collection Efficiency	% Sea Salt
Winter	100	100	100	69	20
Spring	91	100	100	81	5

Notes: This station terminated operation after 20 weeks (January 1 through May 22) of 1990.

MUSQUASH

Weekly Concentrations and Measurements¹

Week	pH	Cond. μs/cm ²	Alk. mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ESO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.17	40.0	-4.3	.376	.217	1.720	.100	.135	.480	2.750	2.17	6.4	97.4	10
2	4.19	43.6	-3.9	.469	.168	1.320	.094	.201	.580	2.270	2.18	60.4	75.4	13
3	4.01	83.0	-5.8	.329	.291	2.850	.149	.370	1.520	4.150	4.45	25.0	69.4	13
4	4.67	17.7	-1.8	.282	.116	.949	.031	.071	.190	1.580	1.16	122.8	--	25.9
5	5.17	9.0	-.7	.206	.052	.323	.061	.009	.110	.890	.96	24.6	46.2	18
6	4.22	38.3	-3.8	.144	.086	.676	.050	.246	.600	1.010	2.49	40.8	79.6	10
7	4.26	41.7	-3.4	.477	.293	3.310	.107	.124	.650	3.370	1.43	35.0	77.3	10
8	4.47	17.7	-2.1	.175	.035	.359	.032	.071	.280	.708	1.03	45.4	87.6	13.17
9	4.33		-2.3	1.310	.593	4.680	.199	.053	.470	10.140	3.56	7.6	42.3	18
10												--	--	4
11	4.17	33.3	-4.7	.098	.056	.610	.042	.214	.340	.946	2.63	42.3	82.3	13
12	4.27	35.6	-4.0	.151	.096	.968	.053	.102	.350	1.810	2.45	31.0	72.2	10
13	4.64	15.9	-1.9	.502	.041	.255	.050	.068	.080	.638	1.83	27.0	52.7	33.18
14	4.33	27.0	-3.0	.126	.068	.663	.045	.063	.200	.922	2.22	43.8	80.8	10
15	4.54	24.5	-2.4	.244	.063	.542	.044	.132	.140	.931	2.04	80.0	81.7	10
16	4.24	50.0	-5.2	.347	.117	1.040	.055	.293	.290	2.020	3.66	31.3	88.4	10
17										.828	8.98	1.0	88.5	13
18	4.72	16.8	-1.9	.073	.067	.546	.043	.110	.100	1.700	1.63	21.0	100.3	10
19	4.55	18.5	-2.5	.062	.091	.844	.049	.098	.100	1.580	1.35	91.4	105.0	13
20	4.68	14.9	-1.9	.048	.036	.367	.031	.032	.070	.496	1.27	57.5	--	16

¹Only weeks with complete chemistry data are included in the volume weighted mean annual values appearing on the previous page. Blank space indicates non-analyzed parameter (usually due to Trace measurements and non-calculated parameters appear as "--". Legend: Codes as per previous page; Prec. = precipitation; Effic. = efficiency of precipitation collection by sampler.

HISTORICAL INFORMATION

1983 - 1990

NICTAU 1985-1990

Six years of precipitation, volume weighted concentrations and deposition at Nictau, New Brunswick.

Year of Operation	Excess Sulphate (ESO ₄) Deposition (kg/ha/year)	Excess Sulphate (ESO ₄) Volume Weighted Concentration (mg/l)	Nitrate (NO ₃) Deposition (kg/ha/year)	Nitrate (NO ₃ as N) Volume Weighted Concentration (mg/l)	Annual Total Precipitation (mm)
1985	19.97	2.04			979.6
1986	15.67	1.68	8.48	0.21	933.7
1987	13.61	1.47	5.87	0.15	926.2
1988	13.96	1.53	12.30	0.32	910.0
1989	14.55	1.38	10.16	0.22	1056.0
1990	19.84	1.36	13.11	0.21	1457.5

Precipitation and sulphate deposition at this site increased dramatically over the last year of this study (Figures 12 & 14). Volume weighted concentration of excess sulphate had experienced a slight downward trend ($R^2=0.79$) during the monitored six year period while nitrate, volume weighted concentration, levels have been relatively invariant (Figure 13).

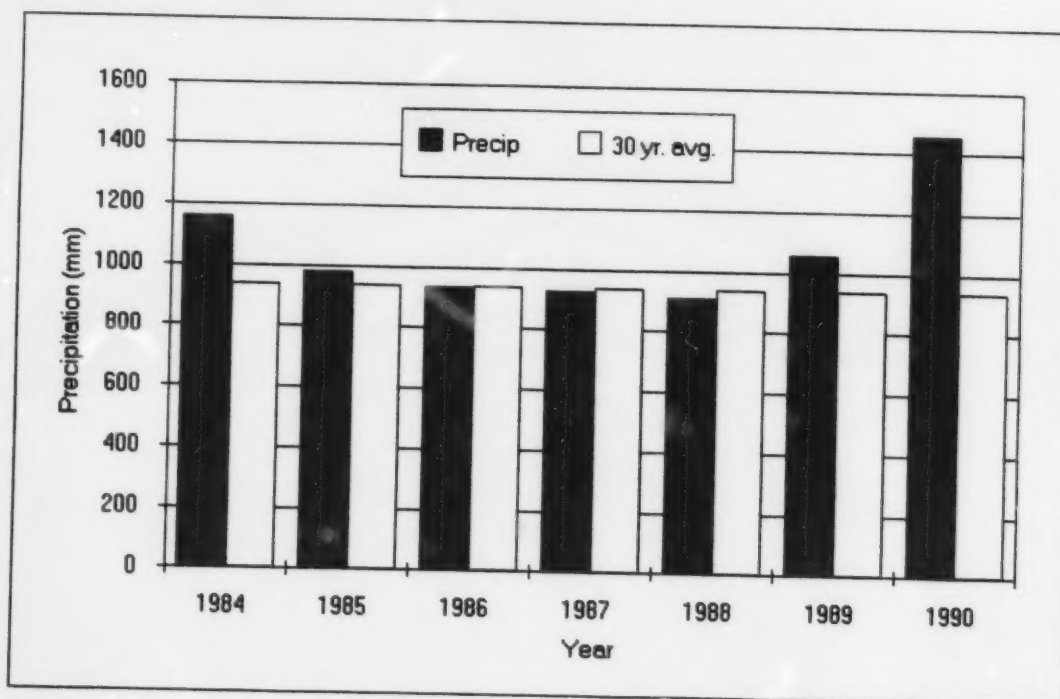


Figure 12. Six years of total annual precipitation and 30 year (1951-1980) mean precipitation at Nictau (1985-1990).

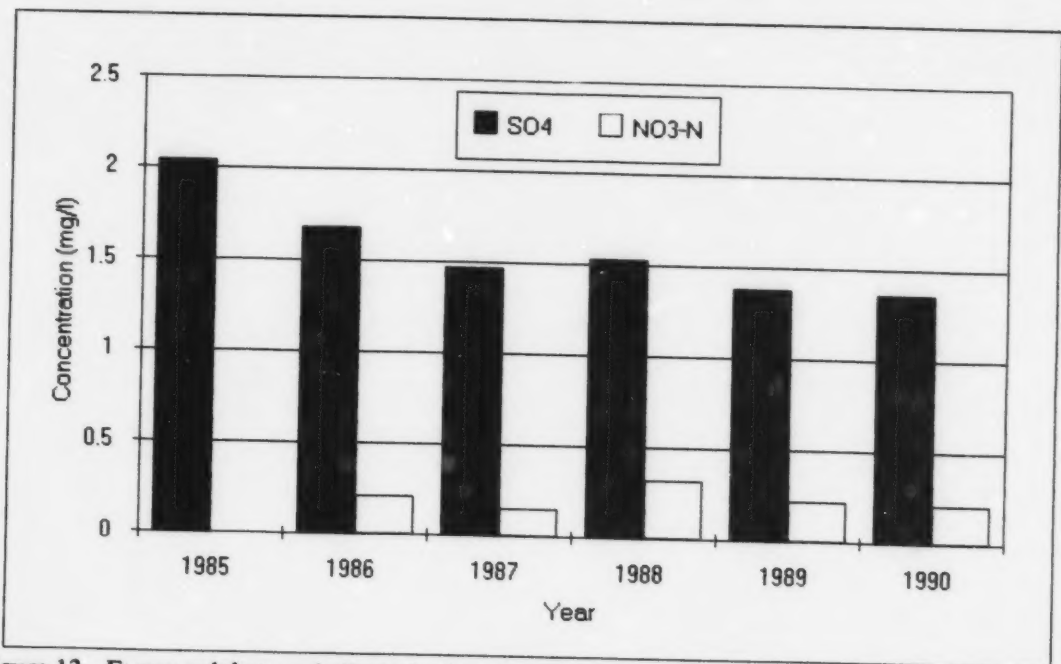


Figure 13. Excess sulphate and nitrate (as N) concentrations at Nictau (1985-1990).

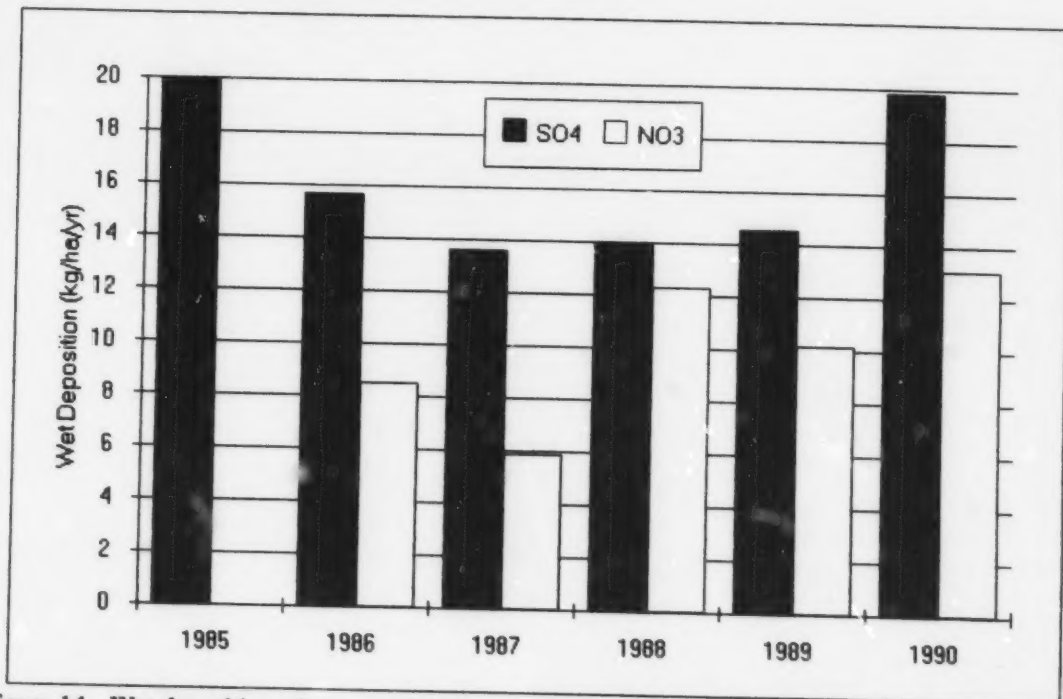


Figure 14. Wet deposition of excess sulphate and nitrate at Nictau (1985-1990).

HISTORICAL LEVELS OF WET NITRATE DEPOSITION IN NEW BRUNSWICK (KG/HA/YR)

Station	1983	1984	1985	1986	1987	1988	1989	1990	Regional Average*
Second Falls						12.3	10.1	12.5	
Nictau	11.1	11.4	10.4	8.5	5.9	12.3	10.1	13.1	
Trout Brook						6.1	8.9	10.9	12.2
Holtville					4.1*	11.7	10.9	13.4	
Harcourt	7.5	9.2	6.7	9.2	5.6	10.3	10.9	11.3	
Acadia	10.4*								
Frog Lake	8.5	11.4	15.3	17.6*					
Magaguadavic Lake				4.1*	8.9	8.1	13.2	11.2*	
Shannon						16.0*	13.4	11.6	
Tracy						13.8*	14.2	11.7	
Juvenile Settlement						14.4*	14.2	15.0*	
Wirral Station						15.3*	15.2	14.6*	
Darlings Island		11.4	16.7	14.1	8.6	12.4	16.5	14.3*	12.9
South Oromocto Lake						15.2*	16.9	13.3	
Lonewater Farm		8.9	6.8	10.3	3.8	14.1	13.6	12.3*	
Golden Grove						13.4*	19.2	12.8	
Lakewood Heights						14.0*	16.6	12.5	
Forest Hills			12.1	13.6					
Bonny River						15.7*	18.5	14.5	
Musquash		13.6*	18.7	14.6	8.9	12.6	20.9	26.5*	
Pennfield						13.6*	19.1	15.5	15.3
Grand Manan	14.5	14.9*							

HISTORICAL LEVELS OF EXCESS WET SULPHATE DEPOSITION IN NEW BRUNSWICK (KG/HA/YR)

Station	1983	1984	1985	1986	1987	1988	1989	1990	Regional Average*
Second Falls						18.9	12.5	21.8	
Nictau	14.7	17.6	19.9	15.7	13.6	13.9	14.5	19.8	
Trout Brook						13.1*	10.9	16.3	19.3
Holtville					8.4*	16.9	14.5	21.1	
Harcourt	11.3	14.8	10.4	14.6	14.3	14.0	13.8	16.9	
Acadia	15.3*								
Frog Lake	16.7	25.8	19.8	26.1*					
Magaguadavic Lake				9.4*	14.5	12.3	18.8	18.9	
Shannon						13.1*	19.8	19.3	
Tracy						12.8*	17.3	18.8	
Juvenile Settlement						14.9*	18.3	21.7*	
Wirral Station						18.1*	17.3	20.2*	
Darlings Island		10.0*	16.0	20.0	14.3	14.8	21.8	21.6*	19.8
South Oromocto Lake						16.2*	21.8	23.2	
Lonewater Farm		10.0*	11.3	21.0	11.8	17.5*	20.0	18.5*	
Golden Grove						20.2*	27.7	24.6*	
Lakewood Heights						12.2*	24.5	26.2	
Forest Hills			30.7	14.0					
Bonny River						25.3*	24.2	22.6	
Musquash			24.2	24.4	19.3	20.3	28.5	39.0*	
Pennfield						20.8*	25.2	25.0	25.6
Grand Manan	17.2	27.4*							

* based on operation for partial year; data extrapolated to reflect a best estimate of full year deposition (i.e. site operated 20 weeks of year, therefore (52/20) X 20 week deposition (kg/ha/period)).

* Averages parcelled into north, central and southern regions of New Brunswick for the calendar year 1990.

NEW BRUNSWICK PRECIPITATION MONITORING NETWORK

QUALITY ASSURANCE

Pennfield Duplicate Site Comparison

The following information describes the data gathered at the collocated site, using identical procedure and equipment for week one 1990 through to week 20, 1990 when the double site was discontinued. Duplication had commenced May 2, 1989.

Pennfield "A"

	pH	Cond. us/cm	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	SO ₄ mg/l	Precip. mm
Mean	4.36	32.37	.219	.096	0.856	.047	.153	0.457	1.555	2.157	30.5
±S.D.	.26	18.58	.119	.067	0.727	.032	.115	0.432	1.233	1.041	23.0
Minimum	3.95	8.98	.019	.035	0.178	.000	.014	0.080	0.140	0.894	0.2
Maximum	4.97	78.30	.425	.248	2.750	.120	.413	1.560	4.120	4.680	87.0

Pennfield "B" - Duplicate Site

	pH	Cond. us/cm	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	SO ₄ mg/l	Precip. mm
Mean	4.36	31.33	.229	.094	0.802	.044	.146	0.438	1.432	2.198	31.8
±S.D.	0.25	16.93	.121	.061	0.587	.022	.115	0.399	1.007	1.002	23.3
Minimum	3.88	11.08	.061	.024	0.167	.021	.012	0.070	0.204	0.955	0.2
Maximum	4.90	79.90	.418	.223	2.040	.089	.424	1.600	3.750	4.730	86.6

Analysis:

No significant difference exists between the data gathered with these two monitors during the first 20 weeks of 1990 (ANOVA $F=.06$ (range $F=0.00$ [pH] - $F=0.25$ [Sulphate (SO₄)]) for all tested site comparisons).

(N.B. Week 9 values declared invalid and not included, from both sites, in statistical analysis.)

PENNFIELD "A"

Weekly Concentrations and Measurements

Week	pH	Cond. us/cm	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	ES ₀₄ mg/l	Prec. mm	Effic. %	Comments
1	4.05	43.6	.300	.221	1.940	.095	.155	0.670	4.120	1.77	5.2	108.3	10
2	4.36	33.4	.425	.123	1.060	.072	.134	0.430	2.660	3.41	38.0	93.4	10
3	3.95	78.3	.281	.192	1.830	.095	.413	1.560	3.000	4.22	13.8	81.8	10
4	4.56	21.4	.279	.134	1.260	.045	.088	0.200	2.260	1.21	77.4	70.3	10
5	4.97	8.9	.170	.036	0.214	.020	.014	0.100	.582	.81	11.0	0.0	15.29
6	4.10	46.2	.109	.038	0.259	.034	.343	0.750	.444	3.12	21.0	103.5	10
7	4.03	65.1	.375	.248	2.750	.120	.264	1.300	3.820	2.40	24.8	0.0	9.20.25
8	4.50	18.3	.099	.040	.396	.023	.058	0.290	.867	.98	33.6	66.5	15
9									2.160*	13.40*	4.4	0.0	25
10											0.0	0.0	4
11	4.28	33.4	.101	.054	.577	.033	.193	0.370	1.060	2.66	36.0	99.3	10
12	4.24	28.4	.152	.075	.800	.042	.090	0.270	1.400	2.12	19.0	102.1	10
13	4.44	18.6	.326	.039	.178	.021	.045	0.120	.140	1.88	17.0	67.8	10
14	4.43	20.3	.234	.080	.349	.024	.073	0.210	.717	1.66	35.6	104.4	10
15	4.44	29.2	.357	.077	.529	.043	.168	0.230	1.050	2.40	54.4	101.0	15
16	4.21	48.4	.239	.105	.932	.065	.305	0.400	1.710	3.56	22.0	110.5	10
17								0.980		.98	0.2	168.2	19
18	4.63	18.5	.226	.035	.329	---	.100	0.080	.452	1.59	17.0	101.3	10
19	4.64	19.5	.068	.096	.902	.050	.116	0.110	1.870	1.34	87.0	0.0	16
20	4.40	18.8	.084	.038	.255	.023	.039	0.150	.293	1.54	36.4	116.9	19

Pennfield "B" - Duplicate Site

Weekly Concentrations and Measurements

Week	pH	Cond. us/cm	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	NH ₄ mg/l	NO ₃ mg/l	Cl mg/l	E SO ₄ mg/l	Prec. mm	Effic. %	Comments
1	4.27	44.6	.418	.223	1.770	.082	.145	0.660	3.750	1.80	5.2	108.9	10
2	4.38	33.4	.394	.123	.915	.065	.131	0.430	2.170	1.78	39.8	89.7	10
3	3.88	79.9	.347	.203	2.040	.089	.424	1.600	2.510	4.22	13.8	81.9	10
4	4.59	22.3	.209	.133	1.320	.038	.091	0.220	1.860	.98	82.2	67.0	10
5	4.90	11.1	.095	.056	.374	.023	.012	0.100	1.030	.84	18.6	57.4	15
6	4.09	46.0	.069	.034	.244	.027	.343	0.770	.512	3.23	21.4	101.8	10
7	4.17	41.5	.356	.181	1.680	.078	.170	0.830	2.680	1.88	26.2	88.8	13
8	4.46	18.6	.212	.050	.402	.029	.069	0.290	.607	.86	34.2	61.2	10
9	4.17		1.430	.752	5.320	.241	.142	1.090	12.200*	4.85	4.6	51.4	18
10											0.0	0.0	4
11	4.04	34.2	.101	.057	.580	.036	.249	0.390	1.220	2.69	36.8	99.1	10
12	4.30	28.2	.174	.084	.785	.040	.083	0.270	1.210	2.23	20.2	94.5	10
13	4.64	16.5	.244	.036	.167	.021	.042	0.070	.204	1.66	19.0	72.0	10
14	4.50	21.1	.247	.080	.370	.026	.066	0.210	.710	1.63	37.8	99.6	10
15	4.43	29.8	.374	.073	.553	.039	.171	0.250	1.010	2.28	56.0	98.8	15
16	4.20	48.1	.264	.105	.895	.056	.281	0.420	1.650	3.52	22.6	108.8	10
17								1.000			0.2	168.2	19
18	4.56	18.4	.268	.038	.336	.027	.083	0.080	.516	1.60	16.8	102.7	15
19	4.40	19.7	.074	.098	1.010	.056	.104	0.130	2.480	1.34	86.6	0.0	16
20	4.32	19.2	.061	.024	.195	.027	.024	0.170	.225	1.41	36.0	118.6	19

* Contaminated samples.

LRTAP N.B. LABORATORY APPRAISAL.

The New Brunswick Department of Environment laboratory participates in an inter-laboratory comparison program. This round robin system has the participation of independent, governmental and university research labs. Multiple samples of known concentration are provided to each participating lab for analysis. Results are grouped and ranked for each submitted parameter. A median value is determined from the results of all participants and each participating lab is then ranked according to their departure from this derived value. A lab may receive a bias rating ranging from excellent to very poor. Individual labs, which analyze precipitation, may participate in up to three round-robin lab intercomparison tests per year. The New Brunswick Department of Environment laboratory participated in two studies (study 0024 & 0025) during 1990.

Parameter	Rating
Specific Conductance	Satisfactory (study 0025 & 0024).
Grans Acidity	Ranked low bias (study 0025 & 0024).
Acidity to pH 8.3	Ranked low bias (study 0025 & 0024).
pH	Satisfactory (study 0025 & 0024).
Alkalinity (Alk.) - Fixed End Point pH 4.5	Flagged high (study 0025); low on study 0023.
Nitrate and Nitrate	Ranked bias low (study 0025); high (study 0023).
Ammonia	No results reported (study 0025 & 0024).
Sodium (Na)	Satisfactory to slight high bias (study 0025 & 0024).
Magnesium (Mg)	Satisfactory to low flagging (study 0025 & 0024).
Sulphate IC	Ranked slight (study 0025) to moderately high bias (study 0024).
Chloride (Cl) IC	Flagged high to very high (study 0025; study 0024).
Potassium (K)	Satisfactory to low flagging (study 0025; study 0024).
Calcium (Ca)	Biased high (study 0025); biased low (study 0023).

ANALYSIS OF 1990 DATA OUTLIERS

SUMMARY OF DATA OUTLIERS.

Data values greater or less than 2.5 standard deviations from a parameter mean are considered to be outliers. They represent the less than 1% of all sample numbers which lie at the fringe of normal occurrences. In this analysis the means were derived from data gathered over a 18 month period between January 1988 and June 1989. Outliers found in this manner are checked against field information, laboratory practices and office comments to remove those outliers arising from improper procedures, contamination, and laboratory errors. The remaining data, presented below for 1990, are valid and indicate the impact of province-wide occurrences and local extremes.

Values which fell outside of ± 2.5 S.D.'s of 18 month mean (1988-1989) per parameter¹.

Data Outliers	Valid Data	Qualified Data	Invalid Data
> +2.5 S.D.	32%	45%	23%
> -2.5 S.D.	54%	62%	3%

¹Valid, qualified and invalid data determinations were developed from observations and comments taken in the field, laboratory and office. Only valid data outliers are summarized in the following sections.

VALID EXTREME VALUES (> ± 2.5 S.D.) REPORTED AT EACH SITE.

SECOND FALLS

This site experienced a chloride concentration measurement outside the -2.5 S.D. range during week eight. The sodium concentration value during week 51 was beyond -2.5 S.D. from the mean.

NICTAU

Magnesium and potassium were measured below -2.5 S.D. of the parameter means during week three. Week 28 of 1990 provided low outliers of sodium and chlorine with high (+2.5 S.D.) measurements of alkalinity. Week 30 had low outliers (> -2.5 S.D.) of potassium and ammonium, while ammonium concentration beyond the +2.5 S.D. mark was measured during week 44. The final outlier data occurred at this site during week 49, conductivity, acidity, nitrate and magnesium all had values below (< -2.5 S.D.) the normal range of variation.

TROUT BROOK

Conductivity and acidity concentration outliers (> -2.5 S.D.) occurred during week 21. Conductivity accompanied by sodium, were outliers (> -2.5 S.D.) again during week 28. A potassium outlier (> -2.5 S.D.) occurred during week 34 and then again in week 35 when it was accompanied by sodium. Week 35 also had a high outlier (> +2.5 S.D.) with ammonium. The final outliers occurred at this site during the 49th week when conductivity and acidity were less than (> -2.5 S.D.) the normal range.

HOLTVILLE

The single outlier to occur at this site took place during week 48 when potassium concentration was less than (> -2.5 S.D.) the normal range.

HARCOURT

Two exceedences (> +2.5 S.D.) above the parameter mean occurred during week 22 (both pH and alkalinity). Calcium concentration was greater than -2.5 S.D. below the parameter mean during week 47 and then again during week 49 when it was accompanied by low outliers of potassium and ammonium concentrations.

MAGAGUADAVIC LAKE

No outliers.

SHANNON

Calcium levels jumped above the +2.5 S.D. range during week 17. The only other incident of outliers occurred during week 48 when ammonia concentration levels were greater than +2.5 S.D. the range of normal variation.

TRACY

Potassium levels were less than the normal range (> -2.5 S.D.) during week 3. Values of pH increased ($> +2.5$ S.D.) during week 22 while ammonia concentrations levels fell (> -2.5 S.D. from parameter mean). Measured alkalinity outliers (> -2.5 S.D.) occurred during week 24 as conductivity and acidity concentrations outliers increased beyond +2.5 S.D. above their normal variation.

JUVENILE SETTLEMENT

Nitrate and ammonia concentrations increased beyond ($> +2.5$ S.D.) the normal range of variation during the 9th week of 1990.

WIRRAL STATION

Calcium concentration increased above the +2.5 S.D. 18 month mean during week 17.

DARLINGS ISLAND

A potassium concentration outlier (> -2.5 S.D.) occurred during week 4.

SOUTH OROMOCTO LAKE

A sulphate concentration outlier greater than +2.5 S.D. above the normal variation range occurred during week 17 while excess sulphate and nitrate concentration outliers $> +2.5$ S.D. occurred during week 24. An acidity outlier greater than +2.5 S.D. above the eighteen month parameter mean occurred during week 27. Conductivity and ammonia concentrations were outliers (> -2.5 S.D.) during week 31 while an alkalinity outlier (> -2.5 S.D.) occurred during the 42nd week of 1990.

LONEWATER FARM

No data outliers.

GOLDEN GROVE

Nitrate concentration levels were above +2.5 S.D. from the 18 month mean during the third week of 1990. Conductivity, acidity, excess sulphate and ammonia concentrations were outliers (> -2.5 S.D.) during week 21.

LAKEWOOD HEIGHTS

A chloride concentration outlier ($> +2.5$ S.D.) occurred during the 3rd week. Conductivity and ammonia concentrations were outliers (> -2.5 S.D.) during week 21 and then again during week 31 of 1990.

BONNY RIVER

Outliers of pH and alkalinity greater than +2.5 S.D. occurred during the 21st week of 1990 while at the same time nitrate concentration was greater than -2.5 S.D. from the parameter mean. An excess sulphate concentration outlier occurred during week 29, conductivity during week 31, and nitrate concentration during week 38 of 1990, all greater than -2.5 S.D.'s from the individual parameter means.

MUSQUASH

No data outliers.

PENNFIELD

Alkalinity and pH outliers ($> +2.5$ S.D.) occurred during week 21 while sodium concentrations were greater than -2.5 S.D.'s. Outliers of acidity were greater than $+2.5$ S.D. during week 27 and then again with sulphate, excess sulphate concentration, and ammonia concentration during week 33. Outliers of pH and alkalinity were greater than -2.5 S.D.'s during the same 33rd week of 1990.

All outliers summarized in the previous section were neither qualified nor invalidated, only valid outliers were presented.

WEEKS FROM WHICH OUTLIERS COULD NOT BE INVALIDATED/QUALIFIED AND THEIR POSSIBLE IMPACT UPON THE VARIOUS REGIONS OF THE PROVINCE.

Possible Result	North	Central	South
Increased Acidity	35, 44	9, 24, 47, 49	3, 17, 24, 27, 33, 42
Decreased Acidity	21, 28, 49	17, 22, 48	21, 29, 31, 38

Key: Northern N.B. stations are those between Second Falls and Trout Brook; Central N.B. include those stations situated between Holtville and Darlings Island while southern sites include those from South Oromocto Lake to Pennfield.

SUMMARY

Precipitation is not composed solely of water droplets, but is a mixture of entrapped atmospheric gases and dust. Water, snow and hail condense around condensation nuclei and airborne dust. Precipitation, therefore, contains a great many components, some of which are routinely measured by the New Brunswick precipitation monitoring network.

Atmospheric gases such as sulphur and nitrogen oxides may combine with precipitation and become transformed to acids.

The established critical load for sulphate deposition in New Brunswick has been set at less than 8 kg/ha/yr (RMCC, 1990). This level has been established to provide for the long term protection of 95% of our province's lands and waters from the damaging effects of acid rain and snow.

During 1990, this critical level (8 kg/ha/yr) was exceeded at all stations by an average of 260%, producing a provincial deposition arithmetic average of 21 kg/ha/yr.

The greatest deposition occurred in the southern portion of the province, most notably at Lakewood Heights (Saint John city) and Pennfield where 45% (85 kilotonnes SO₂, 1990) of provincial emissions originate (Albin, 1992). Trout Brook, situated in the north-central portion of the province, had the lowest annual excess sulphate wet deposition (16.3 kg/ha).

The recently completed modelling study undertaken by Concord Environmental (Davis, *et al.*, 1992) to trace emission source contributions and impact within the province of New Brunswick concluded that a minimum of 81% of the provincial wet sulphur deposition loading had its origin outside the provincial boundaries in the years 1988 - 1990.

With regulations to decrease sulphur dioxide emissions within this province (175 kilotonnes by 1994), in Eastern Canada as a whole (50%; RMCC, 1990), and in the U.S. under their New Clean Air Act, the contribution of sulphur dioxide to acidic wet deposition should decrease. However, model simulations do not predict large wet deposition reductions in the Atlantic region (Royal Society Report, 1992; NAPAP, 1991; RMCC, 1990).

The concentration of excess sulphate has been decreasing at Nictau since 1984. However, with higher than normal precipitation occurring (1989-1990), the wet deposition of excess sulphate has increased. Nitrate concentration (as N) and deposition values have been fluctuating since 1984 with no clear trend.

As sulphate deposition is reduced, that portion of acid rain arising from nitrates may increase. Nitrate deposition in the province during 1990 ranged from annual values of 11.6 kg/ha at Magaguadavic Lake and to 26.5 kg/ha Musquash (best estimate for full year deposition), respectively. The average nitrate deposition was 12.5 kg/ha. Nitrate deposition has been increasing in New Brunswick, most especially in the Saint John city area.

Wet nitrate deposition, during 1990, was generally homogeneous across the province, with a slight north-south trend of increasing deposition. Annual excess sulphate deposition determinations provided a stronger north-south deposition gradient.

A division of the province into east and west regions centred at the Holtville station produced similar nitrate wet deposition averages. However, the eastern region had the greatest variability in deposition, due possibly to the inclusion of the industrial facilities and urban influences of the Saint John city area. A similar pattern appeared when comparing sulphate wet deposition annual measurements.

Sites situated along the southern coast of the province received the greatest amount of precipitation with the Bonny River site receiving the greatest annual total. Second Falls, situated in the northern interior, received the lowest annual precipitation.

The Pennfield and Lakewood Heights stations experienced the most acidic (as pH) precipitation recorded in the province during 1990. These sites are in the region which contains the province's most acid sensitive lands and waters. It is also the most heavily industrialized and populated zone.

Harcourt station, in east-central New Brunswick, reported the least acidic precipitation. The stations located in the northern and northeastern sections of the province had the lowest annual volume weighted acidity values.

Nictau had one of the lowest acid (as pH) precipitation levels in the province and also the lowest level of base cations (eg. calcium, magnesium). Pennfield had the highest concentrations of these base cations due, in large part, to its proximity to the coast.

The station situated at Shannon, in the midst of farmland, received the greatest concentrations of potassium. Potassium is a common earth element associated with dust wind-lifted and transported from agricultural lands.

The area around Saint John, N.B. had the greatest precipitation conductivity. The station within this region also had the among the highest excess sulphate concentrations, a placement shared by the northern and central stations of Second Falls and Holtville. Second Falls and Holtville also had very high nitrate (as N) concentrations.

Trout Brook, Harcourt, Tracy and Shannon had the lowest excess sulphate and nitrate deposition. Tracy, however, was among the most acidic and least alkaline sites in the province.

The data in this report clearly demonstrate that high levels of sulphate and nitrate deposition pose a continued risk to the lands and waters of New Brunswick. Decreases in sulphate concentration have been noted, yet with increased precipitation, in 1990, wet deposition remains high.

COMMENT CODE DESCRIPTIONS

Data comments are assigned to the data base during the quality control process. These comments are intended to identify unusual samples or sampling conditions, so that data users are immediately alerted to the fact that data is qualified. Office comments may summarize items already referred to in field and lab comments. Comments also include statements on data validity. The following office comment codes are used in the Network Database:

- 1 MISSING OR INCOMPLETE DATA (INSTRUMENT MALFUNCTION) - The precipitation collector did not operate properly at some time during the weekly collection period. Partial or no sample was received at the lab.
- 2 MISSING DATA - PRECIPITATION IN STANDARD GAUGE BUT NOT IN COLLECTOR (COLLECTOR OPERATIONAL) - The standard gauge collected precipitation but the collector did not.
- 3 MISSING DATA - SAMPLE LEAKED IN FIELD OR TRANSIT LEAVING INSUFFICIENT VOLUME FOR CHEMICAL ANALYSIS - The sample was less than 5 ml.
- 4 NO PRECIPITATION - No precipitation occurred during the collection period, therefore no data are reported.
- 5 MISSING OR INCOMPLETE DATA - SAMPLE NOT COLLECTED - one or more daily samples were not collected because the operator was not available, or due to severe weather conditions.
- 6 MISSING DATA - SAMPLE LOST IN FIELD, TRANSIT OR LABORATORY - A sample was collected, but no chemical analysis was carried out because it was lost in the field, in the laboratory, or in transit.
- 7 MISSING DATA - OTHER - Other reason for missing data, refer to sample history form.
- 8 MISSING SAMPLE - REASON UNKNOWN - A sample appeared to have sufficient volume for analysis (based on the field weight) but was either not submitted to the laboratory, or was submitted but not analyzed, and no explanation was given. This comment generally occurred with lower volume samples which were rejected by the site operator or the laboratory staff.
- 9 PARTIAL SAMPLE, INCOMPLETE DATA - the precipitation collector did not operate properly for the full week, or operator could not or did not collect one or more daily samples during the week. May be due to sampler malfunctions or power failures. Also used for samples spilled or leaked in the field or lab.
- 10 NO COMMENT REQUIRED - no apparent problems.
- 11 BULK SAMPLE - Sampler was open before and/or after the precipitation event. This comment generally occurred when the precipitation collector malfunctioned.
- 12 NON-STANDARD SAMPLE PERIOD - sample includes precipitation which fell outside the normal operating week, or sample period is less than 7 days. The number of days included and the inclusive dates are noted in the data record. This usually occurs when the operator was not present for regular collections.
- 13 SAMPLE LEAKED (ANALYSES CARRIED OUT) - Collection bag leaked but left sufficient volume for analysis. Leaked water was discarded.

- 14 **INSUFFICIENT SAMPLE FOR ANALYSIS** - A sample was sent to the laboratory but was less than 5 ml and deemed insufficient for chemical analysis.
- 15 **FIELD CONTAMINATED SAMPLE** - Sample was contaminated in the field by handling or direct atmospheric input (includes pollen, insects, dirt, bulk samples).
- 16 **SUSPECT FIELDWEIGHT** - The labweight is substituted.
- 17 **ESTIMATED DATA INCLUDED** - For example, the precipitation amount may have been estimated from the collection catch.
- 18 **LOW COLLECTION EFFICIENCY** - Collection efficiency was less than or equal to 55% (lower 5th percentile of data).
- 19 **HIGH COLLECTION EFFICIENCY** - Collection efficiency was greater than 115% (upper 5th percentile of data).
- 20 **NON-STANDARD PROCEDURES** - Sample was collected using non-standard operating procedures or under unusual circumstances, see field or lab comments for details.
- 21 **STANDARD GAUGE DECLARED INVALID** - Operator not following standard operating procedures (determined during station audit, or by other means).
- 22 **STANDARD GAUGE DECLARED INVALID** - Standard gauge determined to be off level.
- 23 **STANDARD GAUGE DECLARED INVALID** - Standard gauge or Nipher gauge opening obscured.
- 24 **STANDARD GAUGE DECLARED INVALID** - Standard gauge leaking due to breakage.
- 25 **COLLECTION CATCH DECLARED INVALID** - No field weight reported for one or more events or the sample volume is incorrect because the sample spilled or leaked before the field weight was determined. Also used if there was partial or no sample on one or more days due to power failure, instrument malfunction, or other reasons.
- 26 **COLLECTION CATCH DECLARED INVALID** - The sample volume is incorrect because the operator did not follow the proper bag cutting and weighing procedure, and the correct sample weight could not be determined. This flag generally appears during a short period after network start-up when some confusion existed over the weighing of samples.
- 27 **COLLECTION CATCH DECLARED INVALID** - The sample volume is known to be in error as the result of balance malfunction (e.g. balance not zeroed, improper use of balance, sample exceeds balance capacity, or lab weight exceeds field weight).
- 28 **STANDARD GAUGE DECLARED INVALID** - no field value reported for 1 or more events, or operator reports that value may be inaccurate.
- 29 **STANDARD GAUGE QUALIFIED** - see Sample History Form.
- 30 **COLLECTION CATCH QUALIFIED** - see Sample History Form.

- 31 ALTERNATE COLLECTION BUCKET (TYPE A-1) IN USE - collection efficiency calculation modified accordingly.
- 32 BUCKET TYPE CHANGED - no efficiency was calculated since buckets of different dimensions were used during the week.
- 33 SUSPECT DATA - There are reasons to suspect that one or more recorded parameters may be incorrect or inaccurate, although there is no proof (e.g. no record of precipitation when all surrounding sites report some). In this case, the suspect figures are left unchanged in the record. A note will be made on the SHF detailing the nature of the possible error.
- 34 MISCELLANEOUS COMMENT - See Sample History Form for details.

WEEK NUMBER TO DATE CONVERSION 1990.

A week begins at 08:00 am on Tuesday mornings, ending on the following Tuesday at 08:00 am.

Week Number	Dates (month/day)
1	01/02 - 01/09
2	01/09 - 01/16
3	01/16 - 01/23
4	01/23 - 01/30
5	01/30 - 02/06
6	02/06 - 02/13
7	02/13 - 02/20
8	02/20 - 02/27
9	02/27 - 03/06
10	03/06 - 03/13
11	03/13 - 03/20
12	03/20 - 03/27
13	03/27 - 04/03
14	04/03 - 04/10
15	04/10 - 04/17
16	04/17 - 04/24
17	04/24 - 05/01
18	05/01 - 05/08
19	05/08 - 05/15
20	05/15 - 05/22
21	05/22 - 05/29
22	05/29 - 06/05
23	06/05 - 06/12
24	06/12 - 06/19
25	06/19 - 06/26
26	06/26 - 07/03
27	07/03 - 07/10
28	07/10 - 07/17
29	07/17 - 07/24
30	07/24 - 07/31
31	07/31 - 08/07
32	08/07 - 08/14
33	08/14 - 08/21
34	08/21 - 08/28
35	08/28 - 09/04
36	09/04 - 09/11
37	09/11 - 09/18
38	09/18 - 09/25
39	09/25 - 10/02
40	10/02 - 10/09
41	10/09 - 10/16
42	10/16 - 10/23
43	10/23 - 10/30
44	10/30 - 11/06
45	11/06 - 11/13
46	11/13 - 11/20
47	11/20 - 11/27
48	11/27 - 12/04
49	12/04 - 12/11
50	12/11 - 12/18
51	12/18 - 12/25
52	12/25 - 01/01
53	

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